# GRINDING and FINISHING

A HITCHCOCK PUBLICATION

May · 1960

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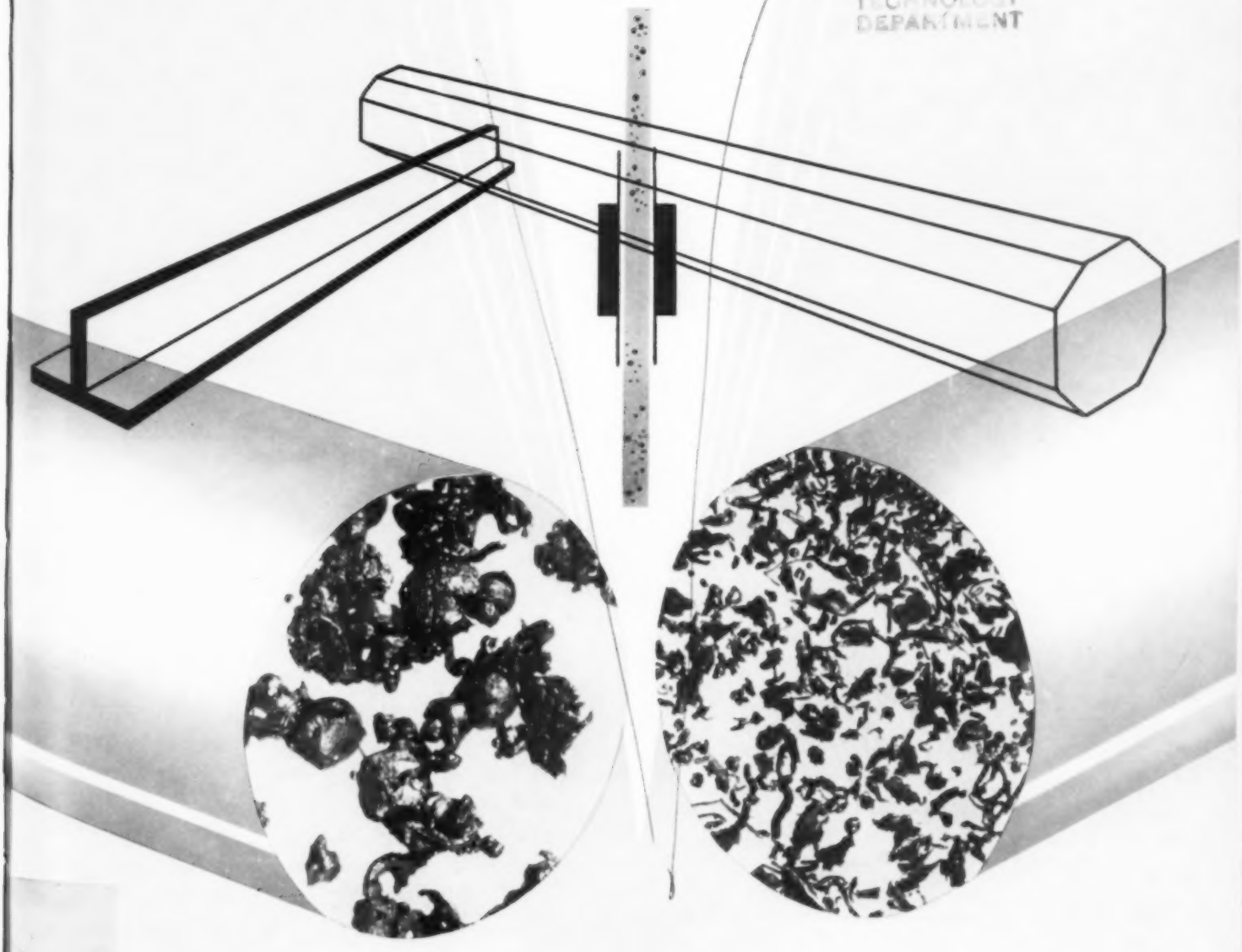

## For Production, Economy, Flexibility . . . Abrasive Cutting! page 36

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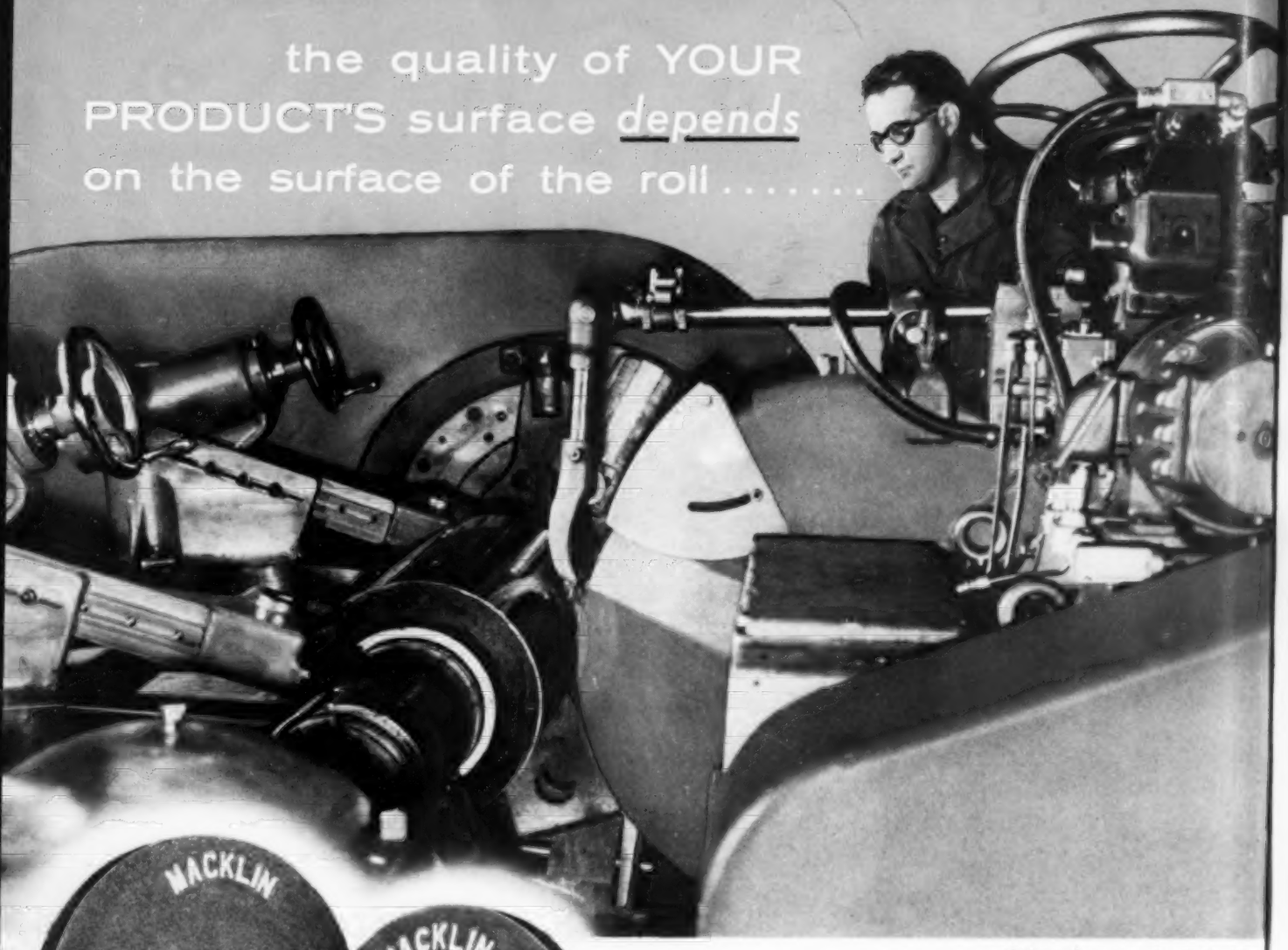
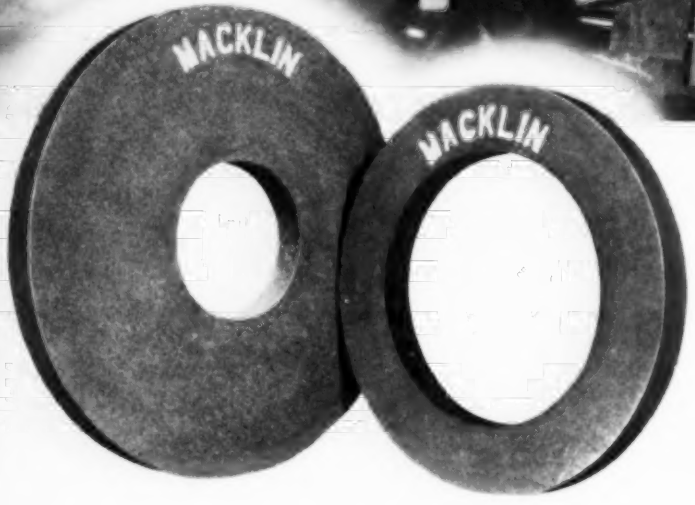
# the quality of YOUR PRODUCT'S surface *depends* on the surface of the roll . . . . . .



photograph courtesy Landis Tool Co.




## you can *depend* on MACKLIN . . . . . "*Wheels of Profit*"

For practical answers to your roll grinding problems depend on custom-engineered Macklin roll grinding wheels. Their controlled porosity and sharp grains give you top production and a surface free of traverse lines and scratches. They cut fast. Provide good finish without chatter . . . and are available in a complete range of grades and sizes.

You'll find it pays to consult your Macklin abrasive engineer. Regardless of the grinding problem, when you make him a part of your product team you can expect results like the performance records at the left.

## HERE'S PROOF OF PERFORMANCE . . .

**HOT MILL WORK ROLLS**
**(Chilled Iron)**

Roll size—25½" x 66" long

Comment—"Since this is a new plant and operators are limited in experience, this wheel has increased their production and produced a good finish of 15 to 20 Micro Inch. All operators are pleased with this wheel. It grinds 100 rolls in 95 hours."

36" x 4" x 20"—GC361 J15 B1268

**COLD MILL TEMPER MILL ROLLS**
**(Forged Steel)**

Roll Size—20½" x 48" long.

Comment—"Macklin wheel ground 265 rolls and removed 2.109" of stock. Competitive wheel ground 156 rolls and removed 1.297" of stock. The Macklin wheel gave 62% more production than previous wheel used."

30" x 5½" x 12"—A70 L11 B2

*Get the complete story. Write for Roll Grinding Bulletin RG60 today.*

GRINDING WHEELS

MACKLIN company

Dept. 63, Jackson, Michigan

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WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

# GRINDING and FINISHING

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Exclusive to GRINDING and FINISHING

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**May Cover:** Two photomicrographs of chips resulting from abrasive cutting are the center of attraction. On the left, chips from dry cutting have melted and resolidified. On the right, chips from wet cutting have not melted, retain their chip form. The whole is an artistic representation of a cut-off wheel parting a bar.

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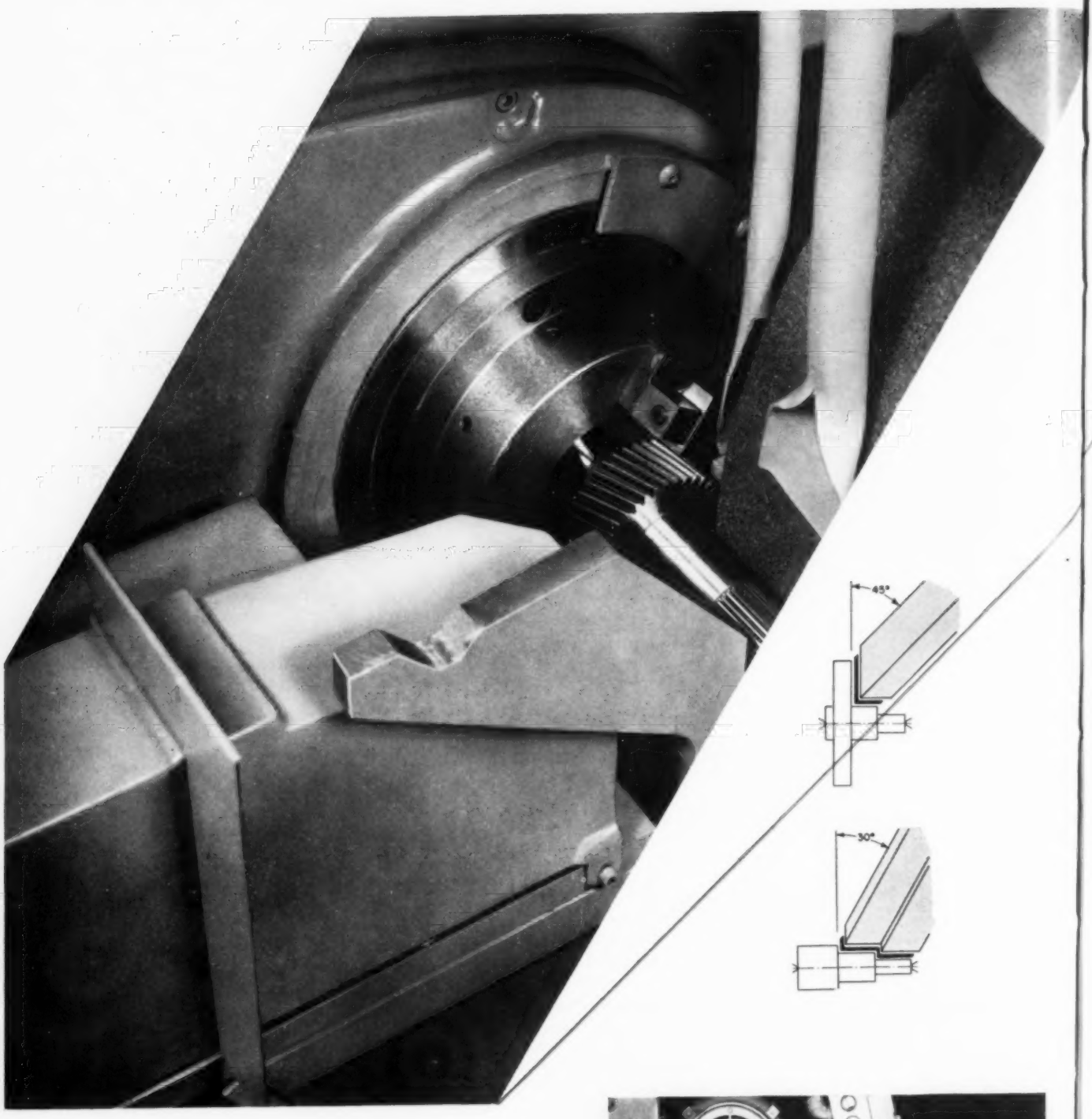
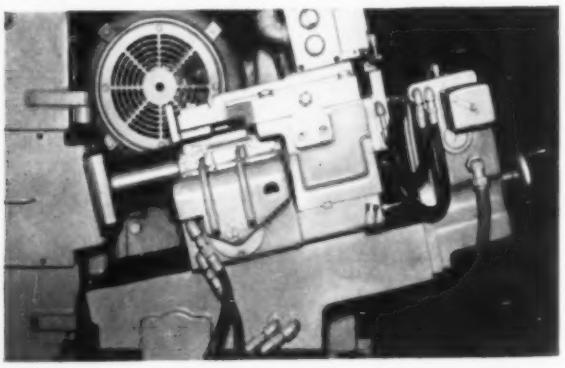



**A long diameter and the adjacent face** of drive gears are precision ground on a CINCINNATI FILMATIC Angular Wheel Slide Grinding Machine equipped with automatic sizing and flagging combined.



**Wheel Truing Unit,** push-button operated from front of machine. Balanced hydraulic system and two-way truing assure precise duplication of cam contour in face of wheel.

BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENT

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

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CINCINNATI FILMATIC

# CINCINNATI GRINDING MACHINE DIVISION checks all the Angles...

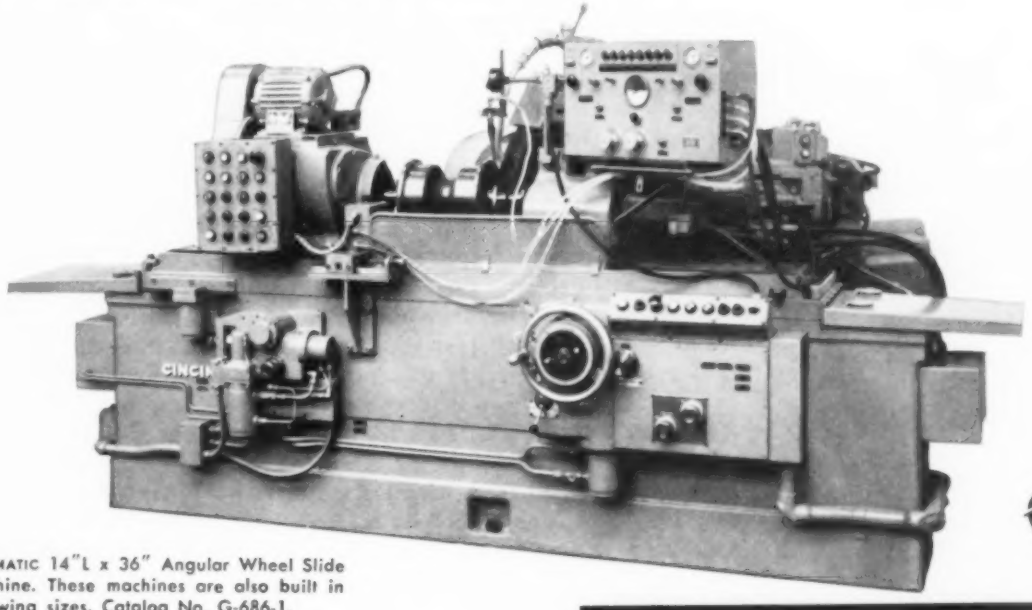
## *to combine diameter and shoulder grinding operations profitably*

Like other methods of machining, precision grinding operations often can be combined at a substantial saving in cost. However, factors other than the mere combining of operations must be considered. Accurate wheel truing heads the list. Cincinnati Grinding Machine Division Specialists solved the problem in a unique and highly successful manner for angular wheel slide grinding.

The wheel is *automatically* trued to exact profile by merely pushing a button at front of the machine. A balanced hydraulic system, incorporating longitudinal and transverse cylinders under control of a directional integrating valve, assures sensitive, precise duplication of the cam contour in the wheel. Profile slide way is anti-friction; no twist, no stick-slip.

Combined diameter and shoulder grinding operations are analyzed from every angle by Cincinnati Grinding Specialists. These men have two wheelhead arrangements on which to base their recommendations —30° for diameters having a length considerably greater than the height of the shoulder, and 45° where height of shoulder equals or exceeds length of ground diameter.

Other feature-advantages include an automatic infeed cycle that incorporates rapid approach, coarse feed and fine feed rates for sizing and finish. For extra high production work where stock allowances are inconsistent, the Gap Eliminator cuts down the time spent in "grinding air." Automatic sizing and flagging are highly desirable quality control features. Complete details are in catalog No. G-686-1. May we send you a copy?

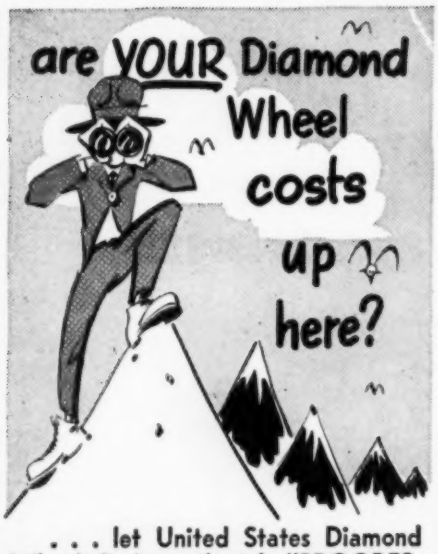


MMT-PE

CINCINNATI FILMATIC 14"L x 36" Angular Wheel Slide Grinding Machine. These machines are also built in 6" and 10" swing sizes. Catalog No. G-686-1.

R-ILL • CHUCKING • CENTERLESS LAPPING

**CINCINNATI®**
**GRINDING MACHINE DIVISION**




. . . let United States Diamond Wheel Co.'s on-the-job "PROGRESSIVE SPECIFICATION" show you how to get "down-to-earth" carbide grinding costs. This scientific system has proved profitable on every application and it is warranteed to do the same for you!

**TEST THE BEST—TRY PRESSURELOK®**

PRESSURELOK (the Performance bond) makes the best of Diamond wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformly at the ideal rate of Diamond usage.

be SURE . . . get
**PRESSURELOK®**

*THE PERFORMANCE BOND*

*This wheel is a precise duplication of your specification, warranteed when properly operated, to give you the lowest cost per cut of any wheel.*

Write for our catalog No. 957 or call us at Aurora TWinoaks 7-9181 for "Progressive Specifications" on your job without any obligation on your part.

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# Editor's Mail

**Subscriptions to GRINDING and FINISHING**

I have been puzzled for some time about how we can obtain a subscription to GRINDING and FINISHING. Several members of our company now receive the magazine while others have received it in the past for only a time.

We have asked some of the abrasive salesmen who call on us and they have also registered concern over not receiving a copy. We have also asked those in comparable positions in other companies and have not received a satisfactory answer. Could you please let us in on the inside story? We believe the magazine will be of benefit and would like to have it available for reference as well.

Jim Hill,
Detroit, Mich.

**Mr. Hill, I believe the best way to answer your questions is to explain what is behind the scene . . . sort of give you a peek at what passes over the desk.**

**Our readers, (circulation) are very important to us. Without good readers, we sure would be wasting a lot of time and money. Without good circulation, we would have to do a lot of fast talking to have anyone advertise and thus support our printing costs. (Honestly, you are part of our product.)**

**Now, all trade magazines fall into two types (circulation). One is called paid circulation; magazines are sent to anyone who is willing to pay. The other type (we are in this group) is called qualified circulation.**

**This second group sends its magazines free to only those readers who use or buy the products of the advertisers. Some time ago a group of controlled circulation magazines felt that they should prove that their readers are what they claim (to keep the shysters out). In order to do this, they banded together and hired an independent auditor called the Business Publications Audit of Circulation, Inc. This company sends men to each magazine and they check all the records. Each copy must be accounted for regardless of whether it is sent to you or used to level up my desk. They must see proof that you have sent us the necessary information and that you are what we claim you are.**

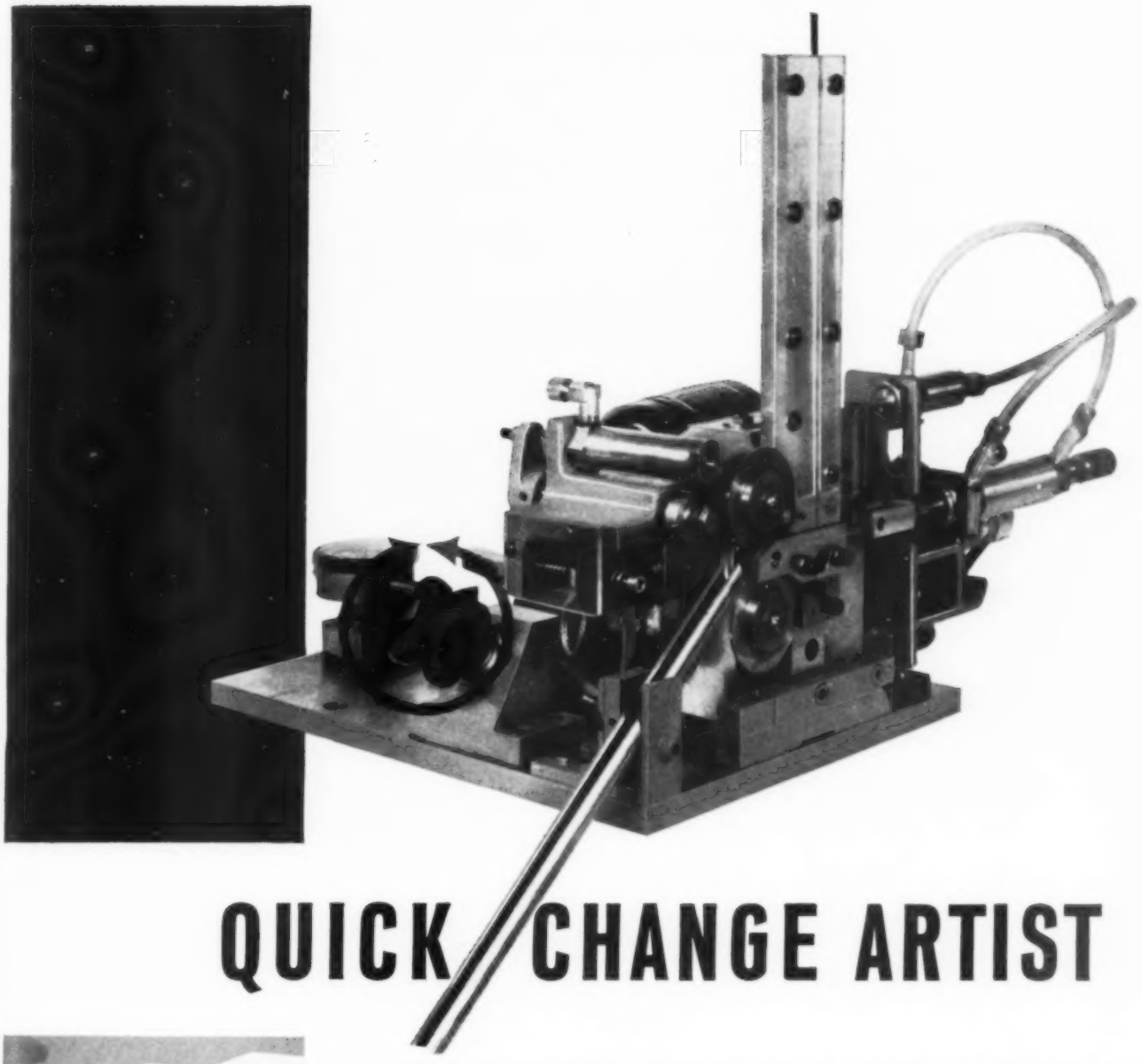
**Now, what has this to do with your receiving the magazine? To start with, it means we, and the auditing bureau, must know your title, name of firm, number of employees, type of operations and product manufactured. If you send this information to us on your company stationery and if you use or buy abrasives, abrasive using equipment and/or accessories, we will send you the magazine as fast as we possibly can for free. Write to: Circulation Manager, GRINDING and FINISHING, Wheaton, Ill.)**

**Let's get back to the auditor. These men come every year and it seems they are not pleased if we cannot prove you have told us what you are within at least the last two years. This is why we send you a card to fill out. When this card is returned, we can then make them understand. Reader Service Cards in each issue also will satisfy our friends. But, if you have not used the Reader Service Card or do not answer the card we send to you, we must assume you no longer want the magazine. This accounts for those who no longer receive the magazine. They may again receive the magazine upon reconfirmation of their faith (in the magazine).**

**Those who sell or manufacture abrasives, abrasive using equipment and accessories can receive GRINDING and FINISHING, but they must show more than casual interest. So, to ascertain that this interest is high and that we will not have a large number of readers who do not use or buy abrasives etc. we charge these people $6.00 per year. There are exceptions to this rule; one, if they are members of the American Society of Abrasives, we feel they have more than an interest in the industry and thus may receive a subscription for $4.50 per year; two, if an advertiser feels that the checking copies are not sufficient for distribution to his men, he may then purchase additional copies to be sent to these people at $4.50 per copy per year.**

**Mr. Hill, many readers have asked the same questions and I hope that this little dissertation will be of help to you and to many others. We are well aware that information, no matter how good, will not be of benefit unless it reaches those who may use it. It has therefore always been one of our primary objectives to reach men such as yourself.**

**Thank you for allowing us the opportunity to set the record straight.**



# QUICK CHANGE ARTIST

Here's "packaged tooling" for internal grinding that's really versatile. With the turn of a single knob, fixtures can be interchanged to permit rapid set-up away from the machine. Production continues with hardly an interruption.

Quick change "packaged tooling" is only one of the many exclusive features of the Bryant Model "B" Centalign® — features which are helping manufacturers of miniature components establish new records for accuracy and production.

If you are grinding the bores or raceways in miniature bearings or similar parts, investigate the Bryant Model "B" Miniature Centalign. It will repay you in increased profits.

**P.S.** Space is no problem with the Bryant Miniature Centalign. It packs all its job-engineered features in only 8¼ square feet.

**BRYANT Chucking Grinder Co.**

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*Internal Grinders • Special Machinery*

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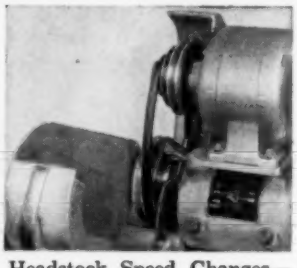
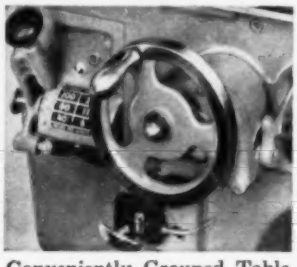
All industry is talking about the new Van Norman



Headstock Speed Changes—V-belt drive to jack shaft provides four work speeds from 153 to 940 RPM through four-step pulleys. Opening guard releases belt tension, makes work head speed changes easy.



Conveniently Grouped Table Traverse Controls—Controls at left include table traverse selector, handwheel, table start-stop lever, one shot lubrication lever—all easily reached by operator. Start-stop lever disengages hand-wheel when power travel is used.

# K&K CUTS SMALL PART GRINDING TIME 50% ...MAINTAINS .0003 TOLERANCE

K&K Grinding Company cut small part production time in half when they switched to VN 418 Cylindrical Grinders. Specifically designed for fast precision traverse or plunge grinding of small parts, this VN machine gives repetitive accuracy and finish to small parts requiring a tolerance of .0003 or less. And it's easily changed over from one job to another.

**4 Headstock Speed Changes**—The VN 418 features V-belt drive to jack shaft, providing four work speeds from 153 to 940 RPM through four-step pulleys. Opening guard releases belt tension . . . makes work head speed changes easy.

**Conveniently Grouped Table Traverse Controls**—All controls . . . table traverse selector, handwheel, table start-

**VAN NORMAN**

**SPRINGFIELD 7, MASSACHUSETTS**

**VN 418 Cylindrical Grinder doubles grinding output of plug gages and small instrument shafts... easily changed over from one job to another... assures repetitive accuracy and finish.**

stop lever, one-shot lubrication lever . . . are easily reached by the operator. Start-stop lever disengages hand-wheel when power travel is used.

**Get Detailed Information**—Your local VN Franchised Distributor is ready to show you how the VN 418 Cylindrical Grinder can cut your production time . . . and costs. Call him *today*.

# MACHINE COMPANY

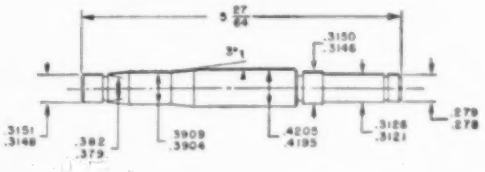
**A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED**

VN

2282

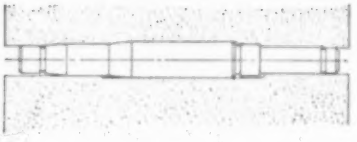
## And here is a typical Van Norman centerless grinder cost-saving application

### CUSTOMER'S PROBLEM:




A prominent electric motor manufacturer had the problem of reducing the cost of grinding the rotor shaft used in their small motors. They were grinding the shaft in (2) operations because they were unable to hold required tolerances when attempting to grind in one operation. Automatic loading and unloading was to be considered.

### VAN NORMAN SOLUTION:



A VN DIVERSIMATIC with Automatic Loading and Unloading Device—Due to the built-in accuracy of a Van Norman Diversimatic the machine was arranged to grind the entire length of the rotor shaft in (1) operation with the machine equipped for automatic loading and unloading mechanism. The preliminary estimate was: the machine would grind 600 pieces per hour at 100% efficiency. Formerly, the top performance on this job had been 300 pieces per hour. A loading fixture capable of holding approximately 300 shafts in a magazine was designed. This was so arranged that it would load one piece at a time between the wheels, grind and eject to the back of the machine at the guaranteed rate.

### THE RESULT:

The machine produced as designed. Holding all tolerances and although customer would accept .0003 runout when part was rotated on journals, Van Norman ground in production parts with run-out not exceeding .00015. Van Norman built-in rigidity paid off again.

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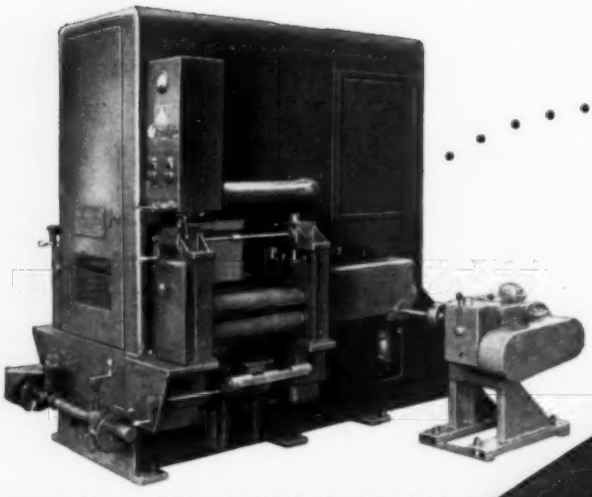
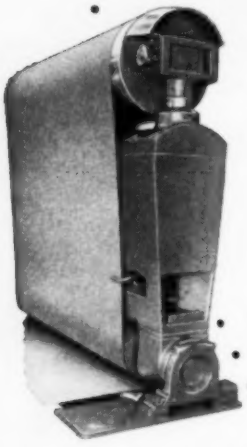


**ABRASIVE BELT GRINDING & POLISHING MACHINE**
**(Pinch Roll Type)**

For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.

# for FINISHES that pass inspection the FIRST TIME get a HILL Grinding & Polishing Machine

MMT-PE



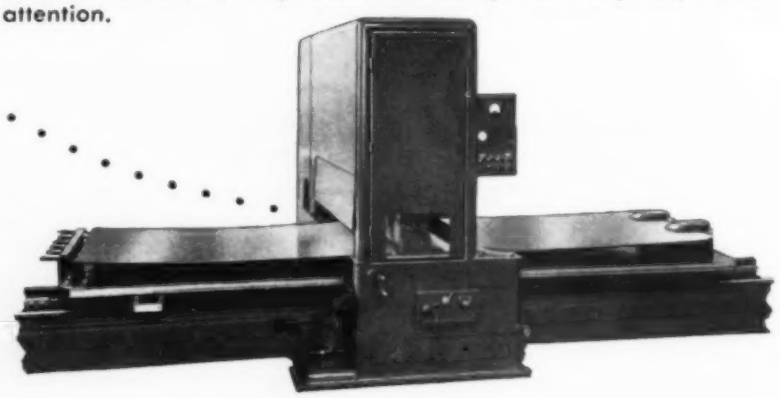
The basic HILL two-roll vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.

● HILL 2-ROLL Vertical Abrasive Belt Grinding and Polishing Machines are made in two general types for producing superior finishes on flat surfaces as required by manufacturers of a wide variety of products such as decorative plastics, auto bumpers, engravers plates, home appliances, etc.

Both types are built in polishing widths up to 60" and larger sizes can be furnished if desired. Your problem will be given our prompt and careful attention.

**ABRASIVE BELT POLISHING MACHINE**
**(Hydraulic Table Type)**

For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with full hydraulic reciprocating table.



## THE HILL ACME COMPANY

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**"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES**

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# Editor's Page

MAY, 1960

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## WHOSE FAULT?

"There we were stranded. My back was killing me and the car was a total wreck! Not even the money I had saved from not relining the brakes or not greasing the thing nor the time I was going to save by doing 95 MPH will make up for the loss. But, I'm not worried. By the time we get through in court, suing the car manufacturer I'll be way ahead of the game. Besides, the cop said the laws here only cover electric cars."

Sounds ridiculous doesn't it? But this is exactly what is happening with abrasives.

Let's look at a point by point comparison and you be the judge of whether this is justice.

First, our friend was hurt. This is fact number one and I'm sure we all agree this is bad—whether it was from the car accident or from an accident with a grinding wheel.

Secondly, he admittedly was careless in his treatment of the car. Maybe I shouldn't go further, but what is the difference between a person being careless with a two ton car at 95 MPH or a grinder being careless with a grinding wheel going 110 MPH.

Our friend's treatment of his car and the improper treatment of a wheel is of little or no difference in my mind. Both have been the cause of their own dilemma.

Third, the suing of the car manufacturer, I don't believe, has ever been tried and I doubt if it ever will be except in the cause of faulty material, design or workmanship that could be proved beyond a shadow of a doubt. And yet we understand that this is the case with the grinding wheels. From the talk in the industry, it appears to be open season on the grinding wheel manufacturers. As soon as a wheel breaks, they try to fit it on the docket as soon as possible.

And last, the point which is probably as ridiculous as all the rest is the state safety codes. Our friend mentioned that the cop said the laws only cover electric cars; well, many state safety codes for wheels are no more up-to-date than this. A few have accepted the American Standards Association's Safety Code but too many are still in the dark ages.

Everyone nowadays seems to be suit happy. If any harm comes as the result of an accident we look to see who we can get some money out of. There is no thought as to who is actually responsible. In the case of grinding wheels it should always be kept in mind that each wheel sold has been tested as a safety factor of five, (this is much more than is done with your car). Millions have been spent to maintain and increase the safety of wheels. But, as long as there is one careless individual, foolish as he may be, and one accident the struggle must go on. This is everyone's responsibility. Ask the wheel manufacturer for his recommendation for safety with his wheels and then practice it.

M. M. Patterson

Managing Editor

# HOW TO MEASURE SURFACE ROUGHNESS with

# New METROsurf*

## *the only battery powered surface roughness indicator*

Small and light enough to hold in one hand, METROsurf is battery powered—ready for immediate use anywhere!

*newest . . . smallest . . . most accurate and rugged*

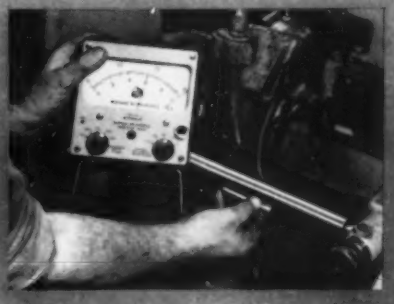
Today's precision requirements rule out "eye" or "feel" methods of checking surface finish. METRO*surf* makes it more accurate, easier and faster.

- *Quickly establishes the requirements for each job and allows faster, closer control of the operation.*
- *5 Range selections for any precision roughness measurement: 3, 10, 30, 100 and 300 microinches — full scale.*
- *Roughness width cut-off available in three ranges: .003, .010 and .030.*
- *Hand held or motor driven tracer.*
- *Long life batteries.*

METRO*surf* is manufactured by the makers of the high-reliability INCHWORM* (Micro-inch Linear Actuator), the Type 170 Electronic Gage, and the Type 160 MICRO*trol**—a control system of micro-inch accuracy readily adaptable to your machine and production requirements.

A CUTLER-HAMMER Sales engineer or gaging distributor in your area will be glad to discuss your problems of surface roughness, gaging or continuous automatic machine operations.

*Call your CUTLER-HAMMER office or write for complete* MICRO*trol catalog.*



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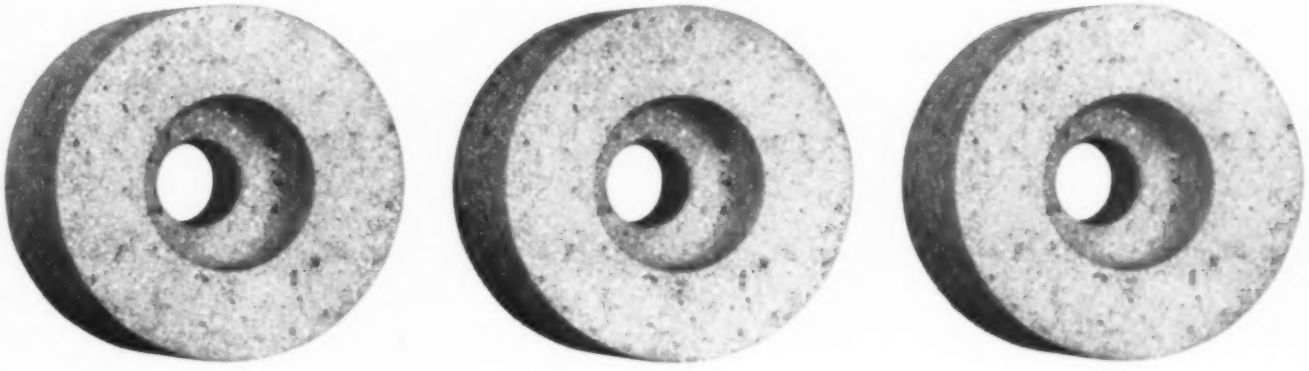

One animal makes tracks like these, a pattern that is positively duplicated only by the grizzly bear. And only Cincinnati offers you the Positive Duplication of these INTERNAL WHEELS, and of *all* CINCINNATI (PD)° GRINDING WHEELS.

## HOW WE ACHIEVE "PD"

To produce these grinding wheels of unsurpassed uniformity, Cincinnati developed a unique manufacturing process. It involves 36 separate quality controls, from formula blend to final inspection. For example, cams for temperature control of drying ovens must pass regular tests for accuracy, and checking procedures never vary.

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# ??? You Asked . . .

ARTHUR RAKESTRAW • Contributing Editor

### Grinding Cam Lobes

**• What grade of wheel would you recommended for grinding cam lobes, 80 to 90 scleroscope hardness?—J. M., Waukesha, Wis.**

It would appear that the main difficulty was to find an abrasive wheel specification that would grind cam lobes of Rockwell C hardness 61-63. However, it is our belief, based on considerable experience with cam grinding, that there is much more involved.

If these cam lobes are a part of an automotive camshaft, we should know the dimension of cams, number per shaft, amount of stock left for rough and finish grinding, and the RMS finish required.

It would also help greatly to know if grinding was performed on an automatic cam shaft grinder or on a cylindrical grinder.

Heat treating processes are of great importance, not only in insuring the required cam surface hardness, but also in reducing the surface tension in the material and improving grindability.

A good average cam shaft grinding specification would be a semi-friable abrasive, aluminum oxide, about 70 grit, grade P, 8 structure, resinoid bond. The resulting finish would depend largely on diamond truing method, wheel oscillation, and work speed.

The number of cam lobes that could be satisfactorily finish ground would depend on the amount of stock removal per cam and on the rate of production.

It is sometimes difficult to understand why abrasive wheel specifications that are entirely satisfactory in one plant do not produce similar results wherever they are applied. There are so many variables in the production of cam shafts that unless all of the conditions to the minutest detail are identical the final results will vary.

### Ceramic Wear Plates?

**• I have a problem with wear on the support plates and back-up plates of a centerless belt grinder. Is it possible to have the face of the back-up plates and the edge of the support plates coated with ceramic? If so, who does this, and what is the approximate cost? —J. K., Bristol, N. H.**

The term ceramic basically is descriptive of molded clay products which have been fired or burned. In a rather wide use, it is applied to porcelain and many glassy-surfaced materials.

These materials, once considered very hard, are now readily abraded with present-day abrasives. They can easily be ground with corundum or silicon carbide abrasives. Stray abrasive grain from the abrasive belts would likely abrade the ceramic-coated surfaces of the back-up plates and work rest.

To be most effective, it would be necessary to make use of materials with a greater wear-resistance factor, more nearly approximating the hardness of the abrasive in the belts.

Tungsten carbide inserts have long been used successfully in centerless grinder work rests, and we feel confident that they could be used in your application. As for the abrasive belt back-up plates, where the larger surface might make tungsten carbide prohibitive from a cost standpoint, you might consider one of the more wear-resistant tool steels.

One of the large abrasive wheel manufacturers in your area has developed a material known as ROKIDE, a sprayed-on layer of aluminum oxide, which is very hard and heat-resistant. To my knowledge, this is the only company making such a product. If you are interested, we suggest that you contact the Norton Company, Worcester, Mass., giving them full details regarding dimensions of plate surfaces.

### Grinding M4 High Speed Tool Steel

**• What can you tell me about surface grinding "Neatro," a hard steel about 60-61 Rc?—G. M., Godfrey, Illinois.**

"Neatro" is a high speed tool steel, SAE-M4, produced by Vanadium-Alloys Steel Co., of Latrobe, Pa. It is one of the most difficult steels to grind. The ratio of abrasive wheel wear per unit of material removed will be comparatively very high.

If surface grinding is to be performed on a horizontal spindle surface grinder, using Type 1 wheels smaller than 14" in diameter, we would suggest the following specifications:

For dry grinding, a premium type aluminum oxide wheel, 60 grit, grade G, 8 structure, vitrified bond. With a coolant, a slightly harder grade of wheel might be used.

A table speed slightly greater than is normally used for hardened carbon steels is also recommended.

In a large number of cases involving the grinding of very low grindability steels such as Neatro, we find that the problem is wholly the ability to remove material. Everyone seems to be searching for some abrasive wheel specification that will grind these materials as rapidly and as economically as the higher grindability steels. It is the comparison of the widely different grinding behavior characteristics that is most confusing to many.

It stands to reason that steels selected on the basis of greater tool and die life between grinds due to their wear-resistant qualities will likewise be more resistant to processing with abrasive wheels. • • •

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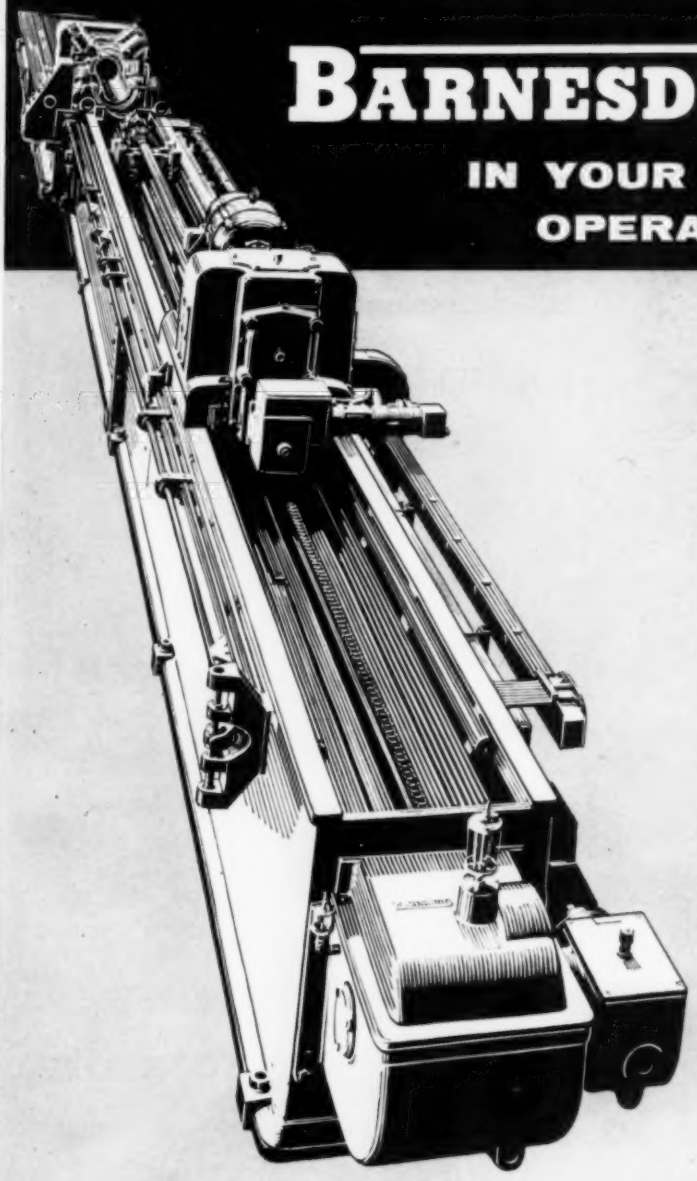

● Fast, accurate, economical metal removal to tolerances measured in tenths of thousandths . . . uniform finishes from 1 to 100 RMS . . . at production speeds. BarnesdriL Honing Machines combine the advantages of geometric accuracy — axial straightness, diametric roundness, and diametric straightness — with metal removal rates comparable to grinding operations. Compensation for stone wear, rapid tool expansion, hone feed, and tool collapse have been integrated as part of the machine function . . . all blended into smooth, fast-reversal stroking by BarnesdriL's exactingly engineered hydraulic drive system.

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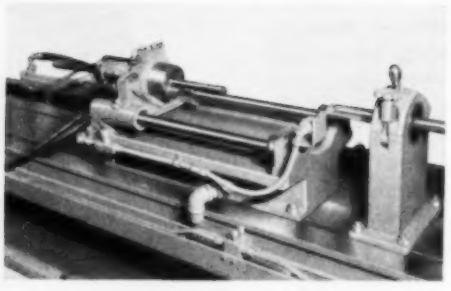
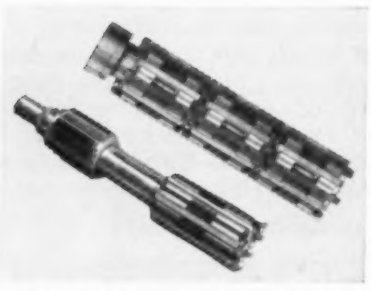
*Speed range and hone expansion can be adjusted electrically in seconds without leaving this conveniently located control panel.*



*Plugmatic gauging mechanism, a BarnesdriL exclusive, gives positive, automatic sizing from bore to bore on production work.*



*BarnesdriL engineers can select from a complete line of tools and abrasives to exactly suit your particular honing requirements.*

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# *Norton Resinoid Wheels Now Better Than Ever*

*Norton Foundry News*

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B11 Wheels BN Wheels BD Wheels

Equipment and quality control in new, multi-million ... maintaining

The great new Norton Worcester Plant No. 8 was built specifically to advance the manufacture and performance of resinoid wheels — the wheels foundries need and use most.

*Norton Foundry News*

*Norton Foundry News*

## BIG NEW PLANT FOR RESINOID WHEELS!

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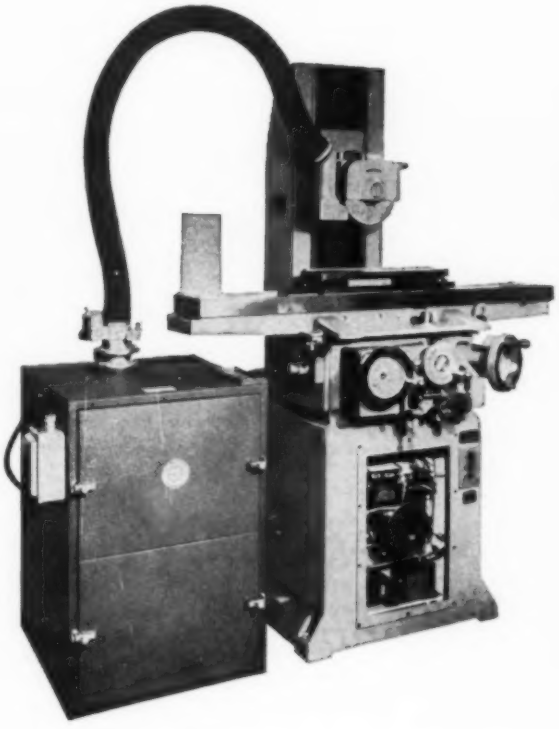
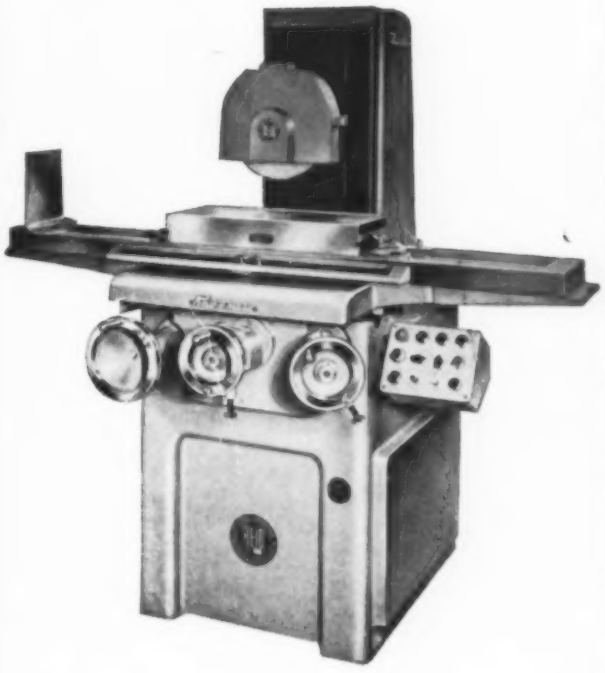


MODEL 618 P
with dust collector



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Send samples of your work to our Sample Processing Department. We'll barrel finish, return samples and report the methods and abrasives you need for better, lower cost finishing. NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

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# Ideas from the Shop

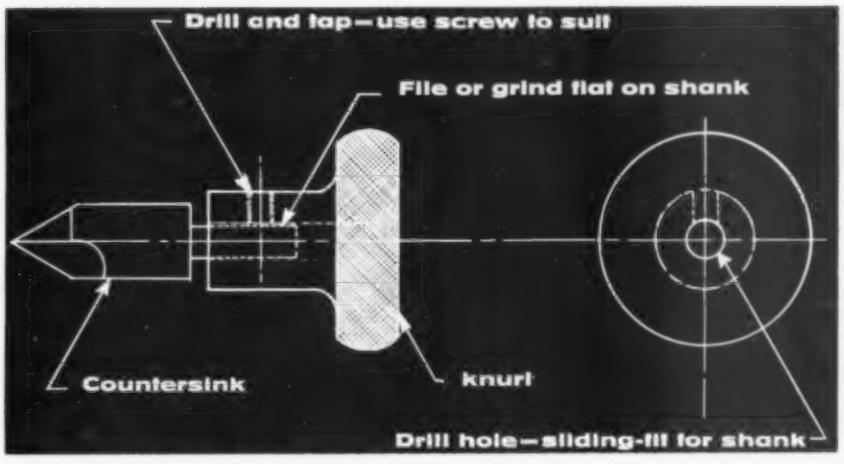
## Deburring Tool

By Robert Hill

• The flanged-knob of a deburring tool which I found to be exceptionally useful is made from cold roll steel, chamfered and knurled to allow a firm holding surface for the hand.

A 60 degree countersink and screw make up the parts list. The shank of the countersink has a flat filed or ground on it for the screw to take a fixed hold when tightened. The screw holds the countersink stationary inside the hole which is drilled to make a sliding-fit for the shank. A hole is drilled and tapped to receive a screw that is to be selected by one's own choice, as shown.

In operation, the shank of the countersink is slipped into the hole in the knob; in turn the screw is tightened on the shank and the tool is ready to remove the burrs from the drilled hole. Deburring a hole with a scraper of the type used in some shops will at times leave dig-in marks when the scraper point touches the wall of the inside diameter on the stock; when the blade is dull or nicked a good deburring job is not possible. I have used this tool, as shown; I have never been disappointed with the results.




## Tilted Wheel Mounting for Surface Grinding

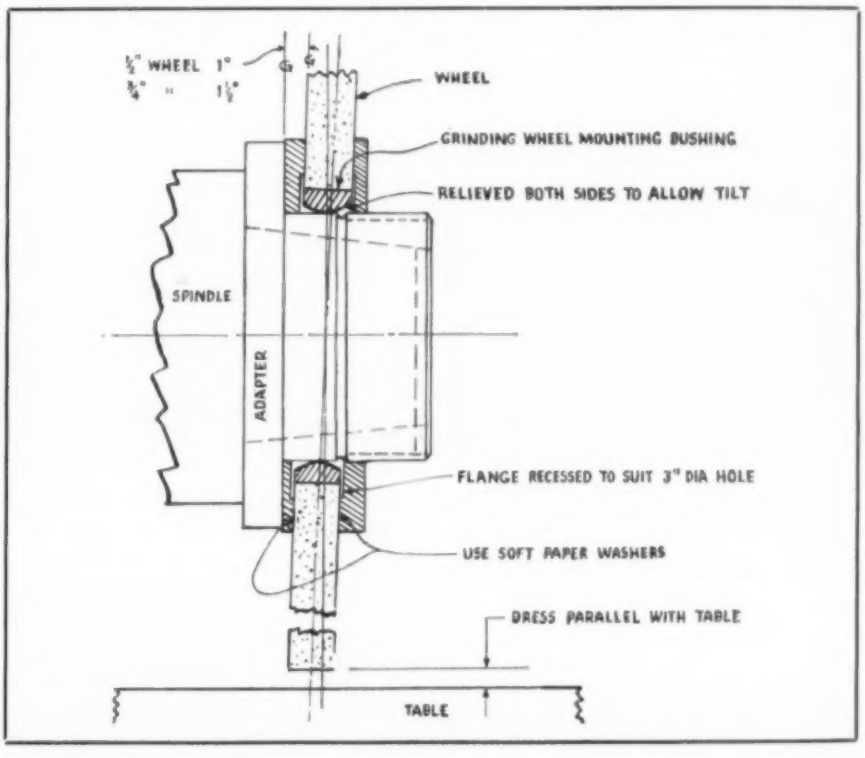
By David Hanna

• Mounting the grinding wheel of a surface grinder on a slight tilt provides for cool grinding of gages and thin parts which require a flatness tolerance on the order of ±.0001".

Due to the wobble, the wheel passes over the work lightly in a wavy or zigzag pattern, reducing the heat from full contact of wheel and work.

For this type of mounting, the wheel bushing is relieved enough to allow the wheel to tilt and clear the spindle at each end of the bushing, but still permitting a metal-to-metal contact between spindle and wheel bushing.

Matched relieved flanges are needed as illustrated, ground so that a 1¾" thick wheel is mounted 1½° off the vertical, and a ½" wheel is 1° off the vertical line. Blotters are used as in a conventional mounting. • • •



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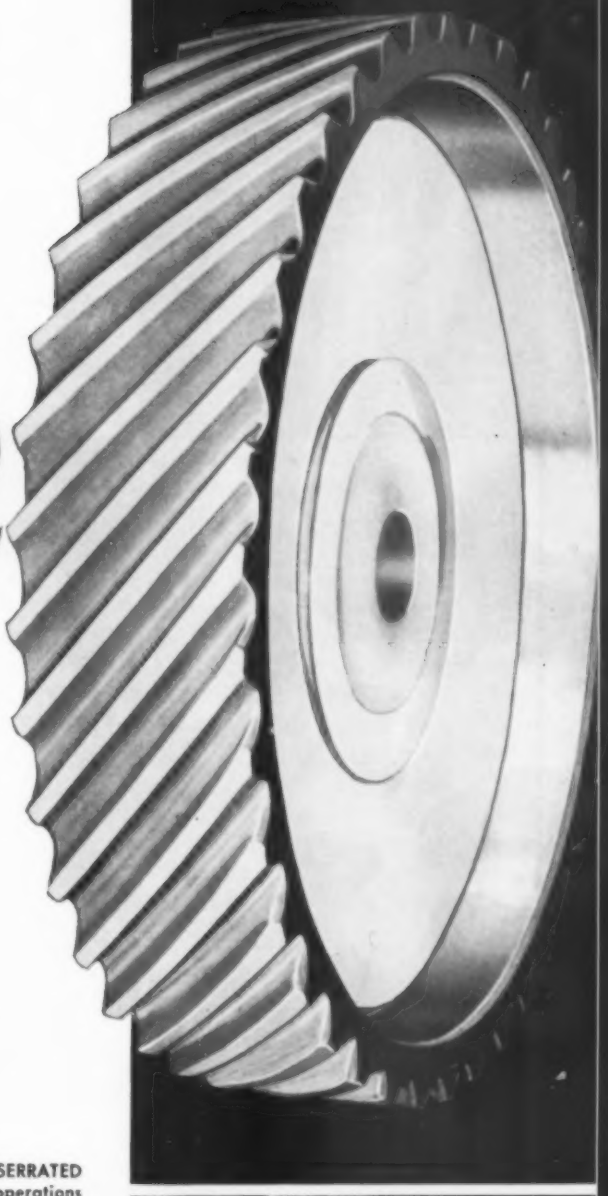
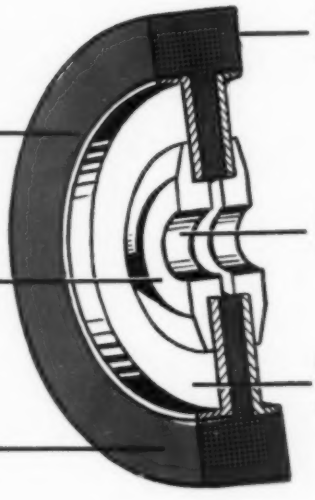
Whatever your product or your grinding and finishing operations there is a highly efficient, perfectly balanced, smooth running R-100 Cosmo molded rubber contact to meet your requirements.



*Molded Rubber Wheels Permit Use of More Abrasion Resistant Rubber Compounds, Provide Uniform Density — Uniform Serrations and Better Wheel Flexing.*

**Profit Building R-100 Features**



SPECIALLY COMPOUNDED MOLDED RUBBER of closely controlled density yields greater tensile strength and assures iron-clad bonding to the steel discs.

ALUMINUM FLANGES are inserted into the standard wheel arbor holes are machined with precision arbor holes to the diameters required by the users.

THE MOLDED RUBBER TIRES are abrasive resistant . . . oil resistant . . . acid resistant . . . in durometer ranges from 10 to 90.

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ALL WHEEL ARBOR HOLES in the two prime steel discs are precision machined to one standard size.

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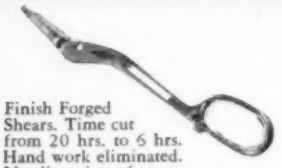

Finish Forged Shears. Time cut from 20 hrs. to 6 hrs. Hand work eliminated. No distortion of parts.

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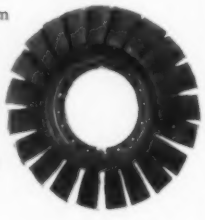
Deburr Aluminum Rotor Fan. Previous method hand deburring. VIBRATRON Process, 10 parts per hour. No hand work required. Greatly improved surface.



VIBRATRON Finishing Machine
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# American Society for Abrasives

## THIRD NATIONAL CONVENTION

The Third National Convention got started with real spirit at the hospitality room of the Pittsburgh Hilton Hotel on the night of April 8th. The sponsoring chapter, Pittsburgh, had done a wonderful job of preparing for the convention and from this start to the banquet on April 9th everything went very smoothly.

Registration and the business meeting started on the morning of the 9th. High points of the business meeting included reports by Leland K. Pruitt, National Chairman, John Y. Arnold, President, and Willard J. Miller, Treasurer, (We're solvent). Werner E. Pfeiffer was introduced as the guiding light of the "News Chips". Following this

Frank B. Rackley

the 14th chapter, Cleveland, was presented with its charter. Joseph L. Cognata, president, accepted. The chapter already has about 100 members. (Congratulations!)

Many of the chapter problems were reviewed and the national officers will take them under advisement. A committee headed by Pat Pascucci, Conn. and including M. M. Patterson, Chicago, Bill Hale, Detroit and Jan Deelman, General Counsel has been formed to streamline the constitution.

Milt Annich and Bert Kemper were elected for five year terms on the board. Frank Blaine was elected to a two year term.

A lunch followed the business meeting. The speaker was M. M. Patterson who pointed out the growing importance of the industry and the great need for the society to continually benefit the individual members.

After the lunch, a panel moderated by John Arnold discussed "Evaluation of Billet Wheels". An excellent presentation was made by this panel which consisted of C. G. Beattie, Jim Daniels, Jay Patten, Larry Seelye, Jim Price and G. R. Blake. Following the panel were two movies. Norton's "Old as the Hills" was excellent coverage of what part abrasives play in our world. The second movie was from Carborundum's English firm and very humorously presented many applications of their products in England.

The main speaker at the dinner was Frank B. Rackley, President of Jessop Steel Co. In a very colorful style Rackley pointed out the importance of the abrasive manufacturers keeping pace with the technological improvements in the steel industry which will increase their capacity 20 to 30 million tons in the next ten years.

"We must find ways to lower traditional costs both for current production and necessary expansion," Rackley said. "And the abrasive industry is expected to do its part."

On April 10th at the National Board meeting Jim Bair was elected president, Milton Annich was elected vice president and John Arnold was appointed business manager.

This convention was attended by 199 men and women. It was a fine tribute to the National and to Jim Bair and the Pittsburgh chapter!

### Long Island Chapter

Cylindrical grinding was the subject for the April meeting, held at Wheatley Hills Tavern, Westbury, L. I., New York. Major topics of the speech were new cylindrical grinding approaches, new equipment, and modern techniques. **Charles Magee** was the speaker.

**Curtis D. Cummings**, sales manager of Allison-Campbell Division of American Chain & Cable Company, spoke on the subject, "Abrasive Cutting in Today's Industry," at the April meeting. The talk was supplemented by a film. A question-and-answer period completed the program.

### Delaware Valley Chapter

**Morrey Patterson,** editor of GRINDING and FINISHING, discussed the long-range outlook for abrasive operations at the March meeting.

Basing his predictions on growth trends over the past half-dozen years, he estimated that by 1970 abrasives would have taken over at least half of all metalworking cutting operations.

At the April 27 meeting a panel of users was scheduled to discuss grinding problems. For May 25, a talk will be presented on barrel finishing; and on June 22, the history and development of glass grinding and polishing will be explored.

### New Jersey Chapter

The March 16 meeting was an eye-opening tour through the Clark Division, Hyatt Roller Bearing Company, under the direction of **Cliff Johnson,** of Clark.

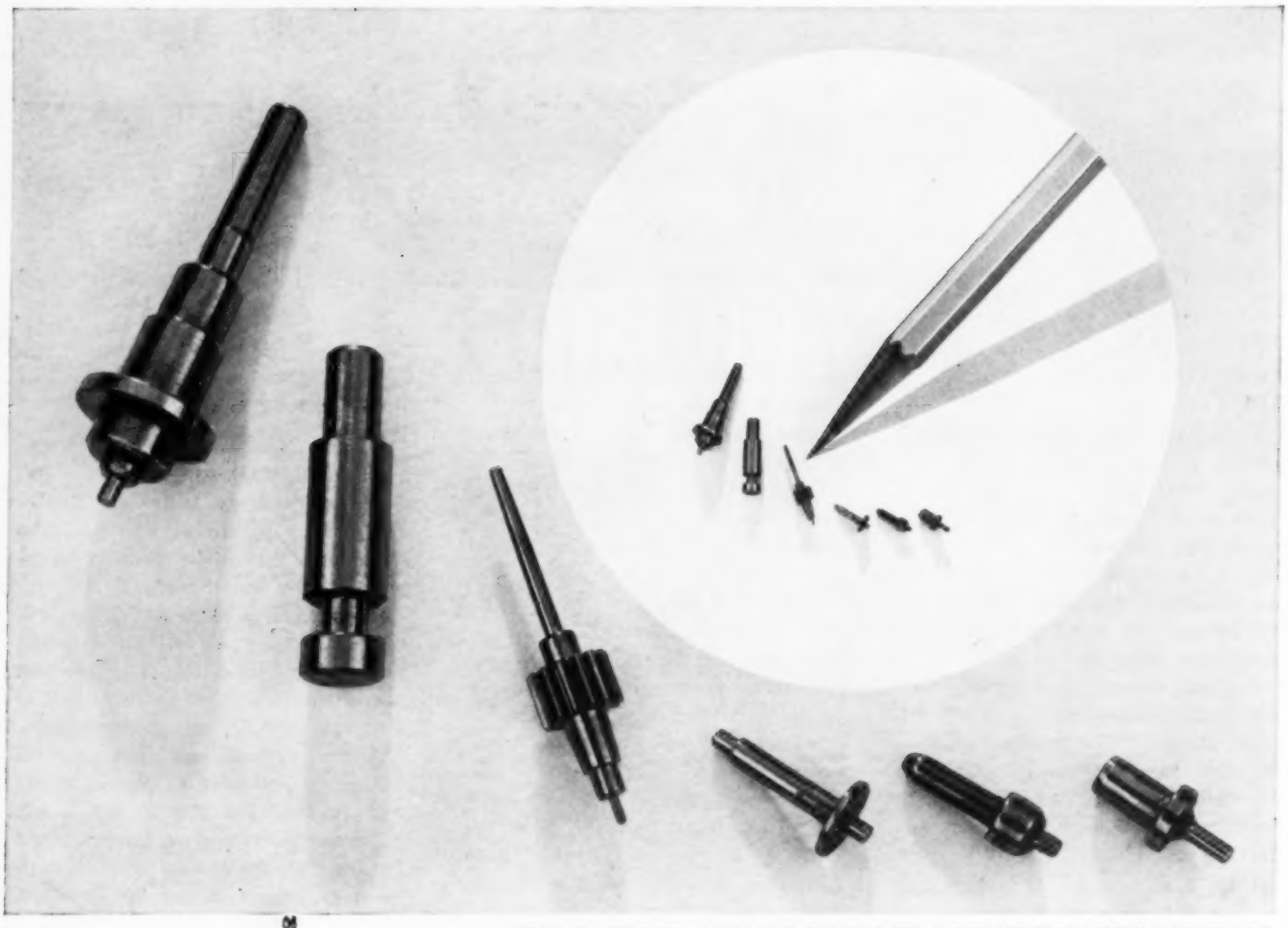
### Detroit Chapter

Speaking on "The Future of Abrasive Operations" at the March meeting at the Rackham Building, **M. M. Patterson,** managing editor of GRINDING and FINISHING, predicted that by 1970 at least half of all metalworking cutting operations would be performed by abrasives.

### Chicago Chapter

**George L. Cornwell**, director of research for The Exolon Company, Tonawanda, New York, discussed the manufacture and processing of aluminum oxide and silicon carbide with some fifty members and guests who had braved the customary bad weather to attend the April meeting.

Speaker at the May 12 meeting will be **Joseph Kessler,** technical sales director, Van Straaten Chemical Company, discussing application of water-soluble grinding compounds in grinding operations.



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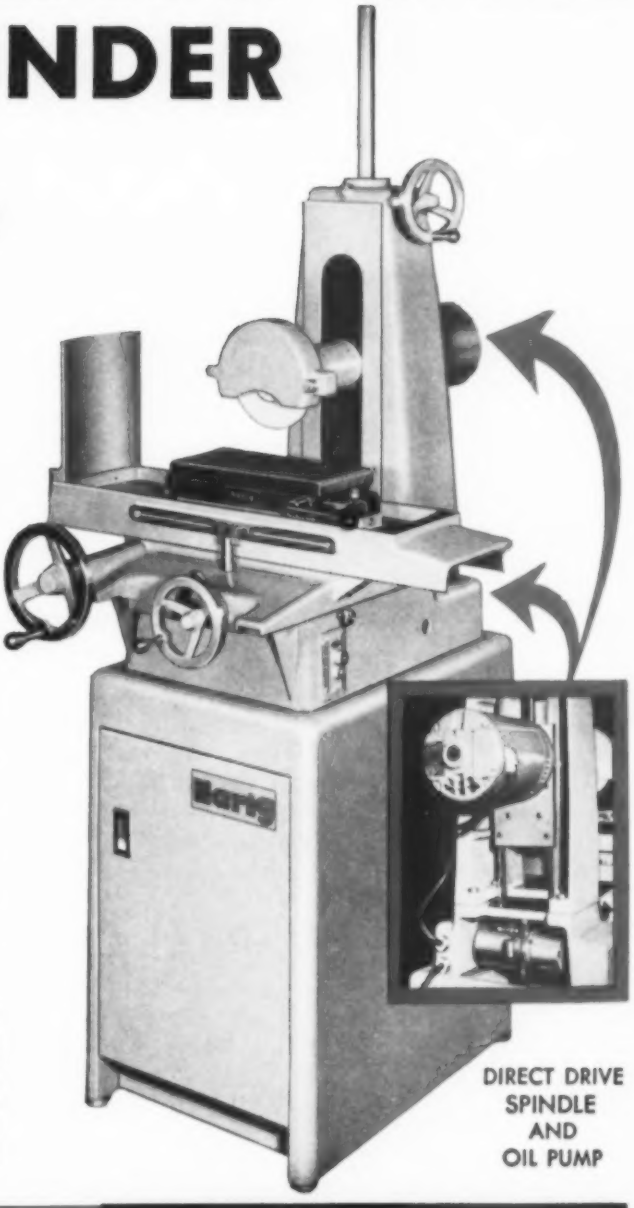


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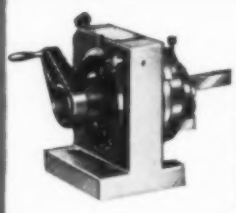

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**Sizing stainless steel honeycomb core on a standard 36 x 96 Mattison Grinder. Since most stainless core is non-magnetic, steel plates accurately ground with Cerrolow 117 alloy provide the necessary holding requirements. A generous supply of water soluble oil is necessary for cooling and cleaning purposes.**

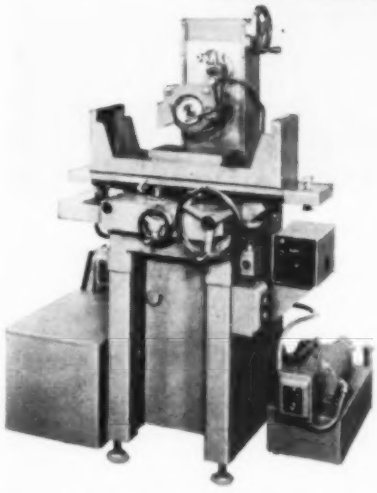
# Latest in Honeycomb Grinding Methods

By BERT J. KEMPER, Manufacturing Engineer
Grumman Aircraft Engineering Corp.

Stainless steel honeycomb cores require accurate, burr and layover free grinding. The methods used to date have been valve stem cutters, electrically-aided grinding and wide coated abrasive belts. Now, Grumman Aircraft, has through careful investigation found that straight surface grinding with bonded wheels is the most economical while fulfilling the requirements.

● The Development Engineering Section, Manufacturing Engineering Department, Grumman Aircraft, recently completed an investigation using conventional surface grinders for machining stainless steel honeycomb core. Close tolerance requirements, layover, and burr naturally are of prime importance in honeycomb construction. This method of machining proved successful with the use of fine grit wheels, correct dressing procedures, slow table feeds and the proper holding fixtures. Proper positioning of the core with respect to ribbon direction is also necessary. Plunge cuts up to .5 of an inch at table speeds of 7 I.P.M. have already been realized. What burr remains can either be brushed or blown off with little difficulty. Contour grinding with forms

**Tapered sections can also be ground by using a sine table set at a predetermined angle. Ribbon direction is particularly important in this case. Only two roughing passes and a finishing pass are required for this precise tapering operation.**



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**with hydraulic table drive (optional)**

Table travel: 7 in. x 13 in.
Work height: 0 in. to 12½ in.
Saddle lock for form and plunge grinding.
Magnetic chucks, permanent and electric types with SELECTRON® rectifier.

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## *NEW GRINDER FITS JOB and OPERATOR*

Here is the newest modern, low-cost DoALL surface grinder. It can double on either your tool room work or production runs.

This outstanding grinder offers you the practical combination of both manual and hydraulic worktable movement. It provides convenience and versatility you'll find in no other grinder. Saddle ways support the entire work area. There's no table climb. Operators can grind directly from handwheel calibrations to "tenth" accuracy—with vertical feed calibrated to .0001 in. and cross-feed to .0005 in. Relying upon this accuracy of controls, operators eliminate the old grind-and-measure practice.

The operator can quickly "fit" this grinder to himself. Machine height is adjustable. Table handwheel is easily moved from left to right side of saddle and its position adjusted radially for greatest convenience. These are a few operating features that increase operator productivity.

Complete line of attachments, such as "Cool Grind" coolant system, hydraulic table control and many others, can be purchased with machine or added in your plant. Before you buy any surface grinder, see the model DH-612. Ask your DoALL Sales-Service Store to demonstrate.

GR-29

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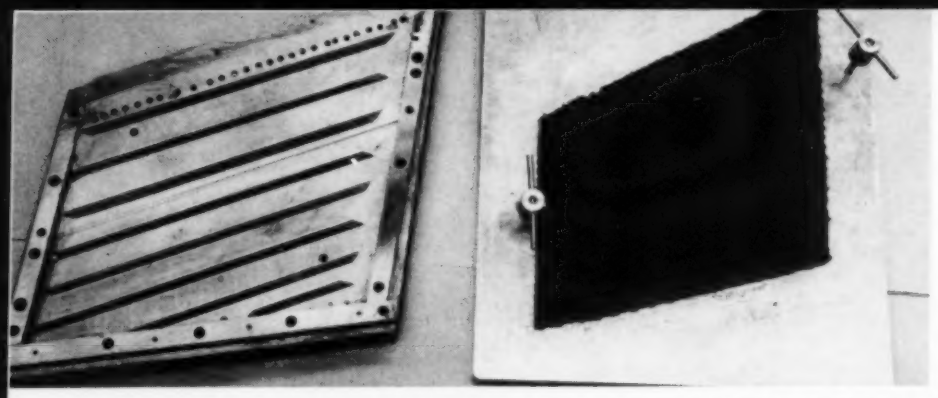

**Picture frame holding core ready for setting in Cerrolow Fixture. Dowel pins will accurately locate the core but will be removed along with frame after the Cerrolow solidifies. Angular slots and holes prevent any possibility of the Cerrolow lifting from the steel plate while grinding.**

dressed into the periphery of the wheel have also proven successful.

The accuracy involved naturally requires holding fixtures that are accurately ground and slotted. A simple rim around the outer edge of the fixture is all that is required to hold the molten Cerrolow. The honeycomb core is placed in a ¼" deep pool of Cerrolow, heavy steel weights are placed on top and the Cerrolow is allowed to solidify, firmly holding the core in place.

Fine grit (220-280) silicon carbide wheels have some advantages over aluminum oxide wheels, particularly on A-286 stainless. On 17-7 PH and 15-7 MO stainless there was no appreciable difference. However in dressing these wheels dull diamonds or diamonds with a flat surface produced a better finish than new sharp diamonds, contrary to good dressing procedures.

Ribbon direction of the core in relation to the wheel is important. On exceptionally heavy passes ribbon running perpendicular to the wheel plane produced a better surface. Table speeds of 7 I.P.M. are necessary to prevent layover, but this is strictly proportional to the amount of material removed or depth of cut. Slow table speeds actually enable the abrasive grain to remove material rather than push the fragile core over. There is very little noticeable difference between climb grinding and conventional grinding.

The accompanying photographs illustrate clearly how a difficult tapered section was ground on a Mattison Surface Grinder. Large sections naturally can be ground with similar ease, since the capacity of the machine is 36"x96". Grinding wheels 10" wide are also being considered even though the standard 6" wide wheel is quite satisfactory.

Electrolytic grinders, wide coated abrasive belt grinders, and valve stem cutters have been the principal methods of machining until now. But the economics of a bonded wheel setup require more attention and imagination since the possibilities are unlimited. • • •


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# NORTON MAKES DIAMONDS

● Norton Company, Worcester, Mass., has successfully made diamonds, Milton P. Higgins, president, said recently.

Norton's active interest in diamond synthesis began in the early forties. At that time a project to investigate the effects of high pressure and temperature on carbon, supported in part by Norton Company, was carried out under the direction of Professor Percy B. Bridgeman, Nobel Prize winner and professor of physics at Harvard University's School of Engineering. This project was concluded in 1946.

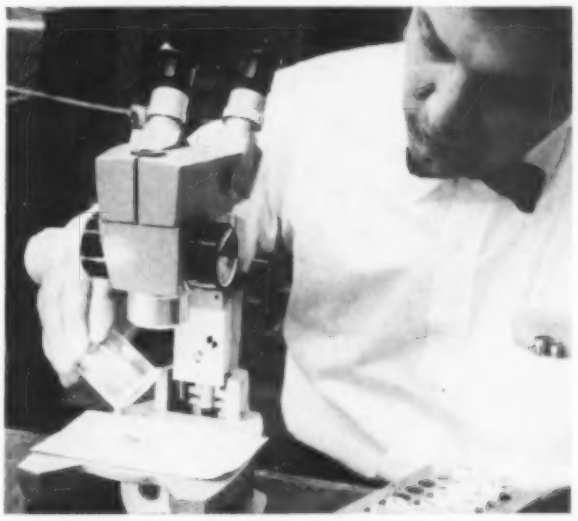
The current project, which lead to successful synthesis of the diamond resumed in 1953 at the Worcester laboratories of Norton Company.

Basic ideas for equipment and processes were formulated and carried forward to successful conclusion by a team of Norton reseachers headed by Loring Coes, Jr., assistant director of research and development, and Dr. Paul P. Keat, senior research engineer. Milton F. Beecher (now retired) was vice president and director of research and development at the outset; and Wallace L. Howe (present vice president and director of research and development) at the conclusion.

Applications for patents on both processes and apparatus have been filed.

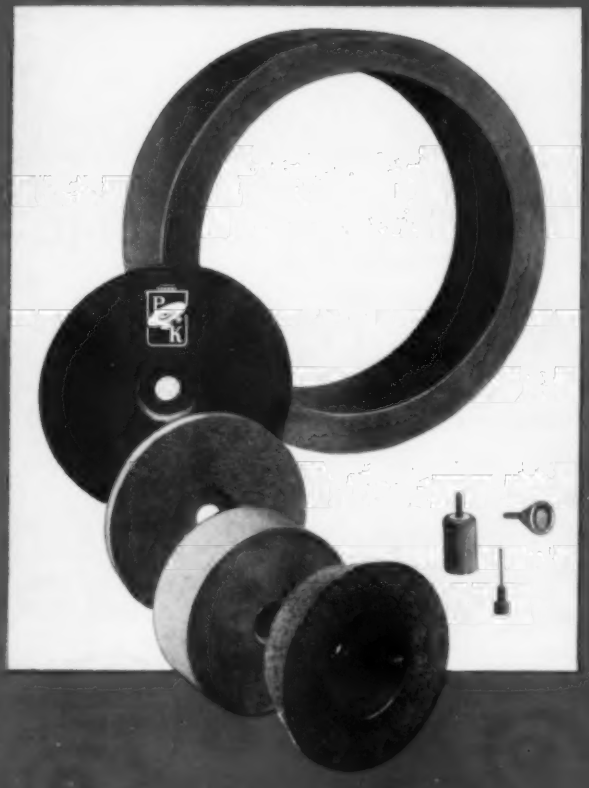
No commercial production is anticipated at the present time, Mr. Higgins said.

Coincidentally, the announcement of this development falls in Norton Company's "Diamond Jubilee" as 1960 marks the 75th Anniversary of the founding. • • •



**Dr. Paul P. Keat, senior research engineer and a member of the team which developed Norton's man-made diamonds, prepares to examine some of the product under a microscope.**


WE ARE MANUFACTURERS of RESINOID and RUBBER BONDED GRINDING and POLISHING WHEELS...



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- Works up to 100 times faster than conventional methods at lower cost.
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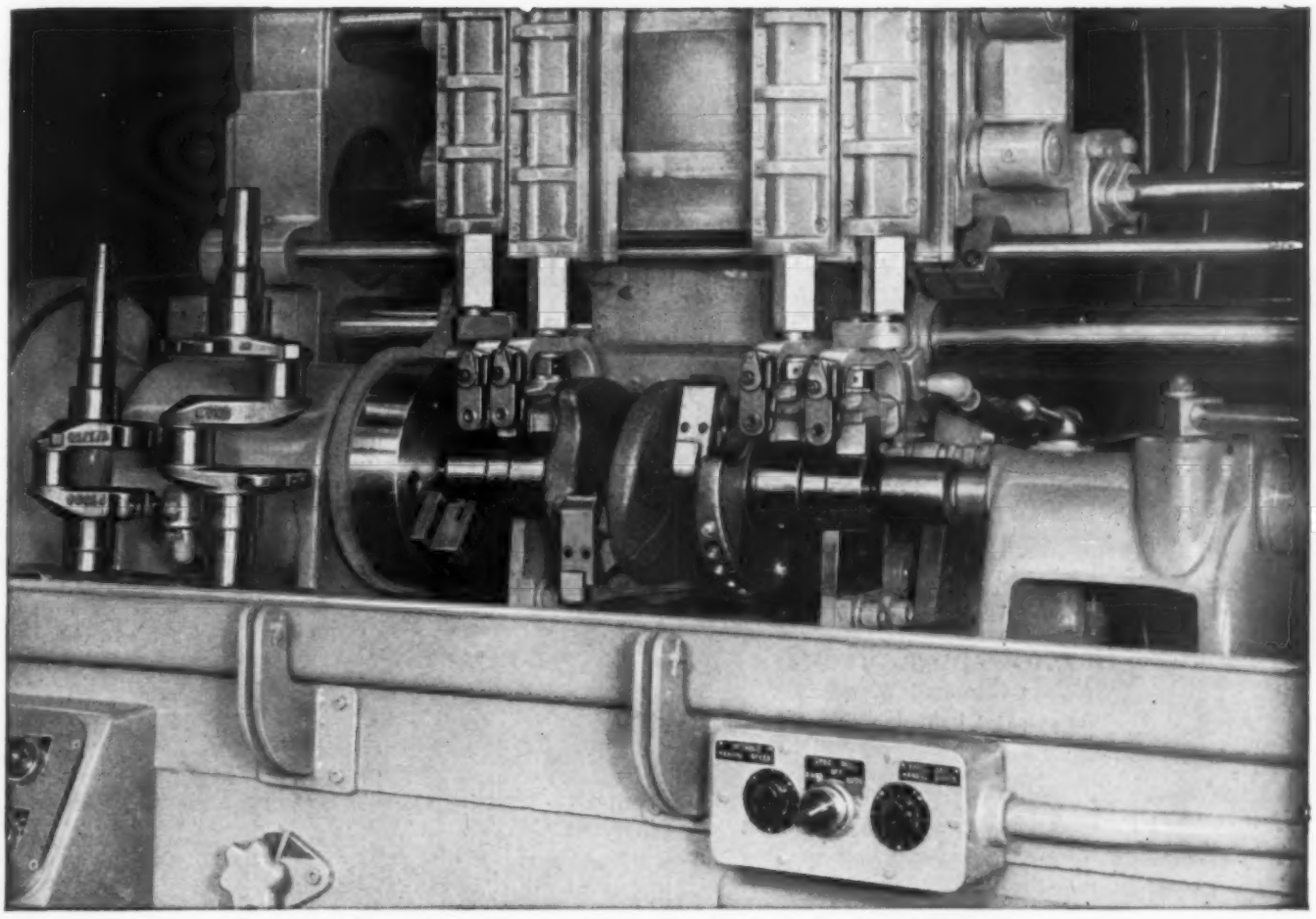

Gisholt 51A General-Purpose Superfinisher handles 44 to 53 crankshafts an hour with 80% efficiency—with one-hour change-over from one crank size to another. Each set of stones Superfinishes over 200 crankshafts on this job.

# What Onan is doing with Superfinish

## Handles crankshaft mains, pin bearings and oil seals simultaneously...gets finer finish at lower cost

There may be a tip for you in the way D. W. Onan and Sons, Inc., Minneapolis, is finishing crankshafts on a high-production basis.

Here's how a Gisholt Model 51A Superfinisher handles up to 6 different diameters in one operation, finishing a variety of single- and 2-throw crankshafts. Loading rails, with a special spindle-inching arrangement for driver positioning, make loading and unloading larger pieces fast and simple.

In a typical operating cycle, the crankshaft is driven between centers from the keyway, using a faceplate driver. Two special latch-on, follower-type arms engage with the crank pins, and 4 longitudinally adjustable quills descend to Superfinish main bearing and oil seal surfaces. Main and pin bearings are reduced from a ground surface of 30 micro-inches RMS to 8 or less. Oil seal surfaces on the shaft ends are Superfinished to 4 micro-inches or less.

Gisholt Superfinishing helps market your product more easily against rising competition. By reducing—or even eliminating—the cost of grinding, polishing, lapping or buffing operations, this modern method provides substantial savings. Chatter marks, grinding flats and amorphous "smear" metal left by grinding are completely removed, exposing true base metal for longer wear and better performance.

Ask your Gisholt Representative for details on the complete line of Superfinishing machines—including Superfinisher attachments, general-purpose models for job-lot production, and high-production models adaptable for automation. Make an appointment with him today—get the facts on this inexpensive process.

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Madison 10, Wisconsin, U.S.A.

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# For Production, Economy, Flexibility...

# ABRASIVE

## Part I

Abrasive cutting properly applied can step up productivity, eliminate material preparation and finishing operations usually associated with less practical cut-off methods.

By HOWARD T. BIECHELE
Allison-Campbell Division
American Chain & Cable Company, Inc.

● An eastern manufacturer cuts off 9½" bars of alloy steel in 20 minutes instead of 2½ hours. Another, cutting Inconel X, reduces time per cut from 7 hours to 10 minutes, saving about $4.00 per cut in supplies into the bargain. A third, from New Jersey, severs in a minute and 15 seconds an alloy steel bar that used to take four hours to cut. These are three examples of the possibilities of thin abrasive wheels for cutting-off applications.

Abrasive cutting, once considered only as a laboratory and tool room operation, is now widely accepted and recognized as a modern and efficient method of cutting not only metals, but many other materials used in today's industrial scene. Glass, ceramics and building materials have joined the long list of metals ranging from low-carbon to the hardest alloy steel and exotic metals, including many non-ferrous metals and alloys.

Before cutting hardened steel by ordinary methods, it is necessary to anneal it at considerable expense and loss of valuable production time. Not so with abrasive cutting which cuts the hardest steel with ease.

The excellent finish and close cut-off tolerances obtained by abrasive cutting frequently eliminate milling or other costly finishing operations.

In addition to lower labor costs, the extreme speed of abrasive cutting offers production capacity out of all proportion to the small floor space required by an abrasive cut-off machine.

Today's space-age metals, the "exotic" metals used in the fabrication of jets, missiles, and rockets, are cut as readily as mild steel by the abrasive method. The same characteristics of "wonder" metals—Rene 41, Discaloy, Incoloy, Refractaloy, Waspaloy, tungsten, molybdenum—which provide resistance to high temperatures, abrasive wear and corrosive atmospheres, also increase the problem of cutting them to conform to production requirements. Only abrasive cutting has kept pace with these new metals, providing a fast and economical method of cutting them.

For example, a manufacturer in Connecticut reports the following result using a Campbell wet abrasive cutting machine equipped with a 34" diameter by 7/32" thick wheel to sever 9½" diameter bars of Hastelloy M. Time per cut was 20 minutes and 10 seconds. By way of comparison, this manufacturer reported that the method previously used required 2½ hours to make a single cut.

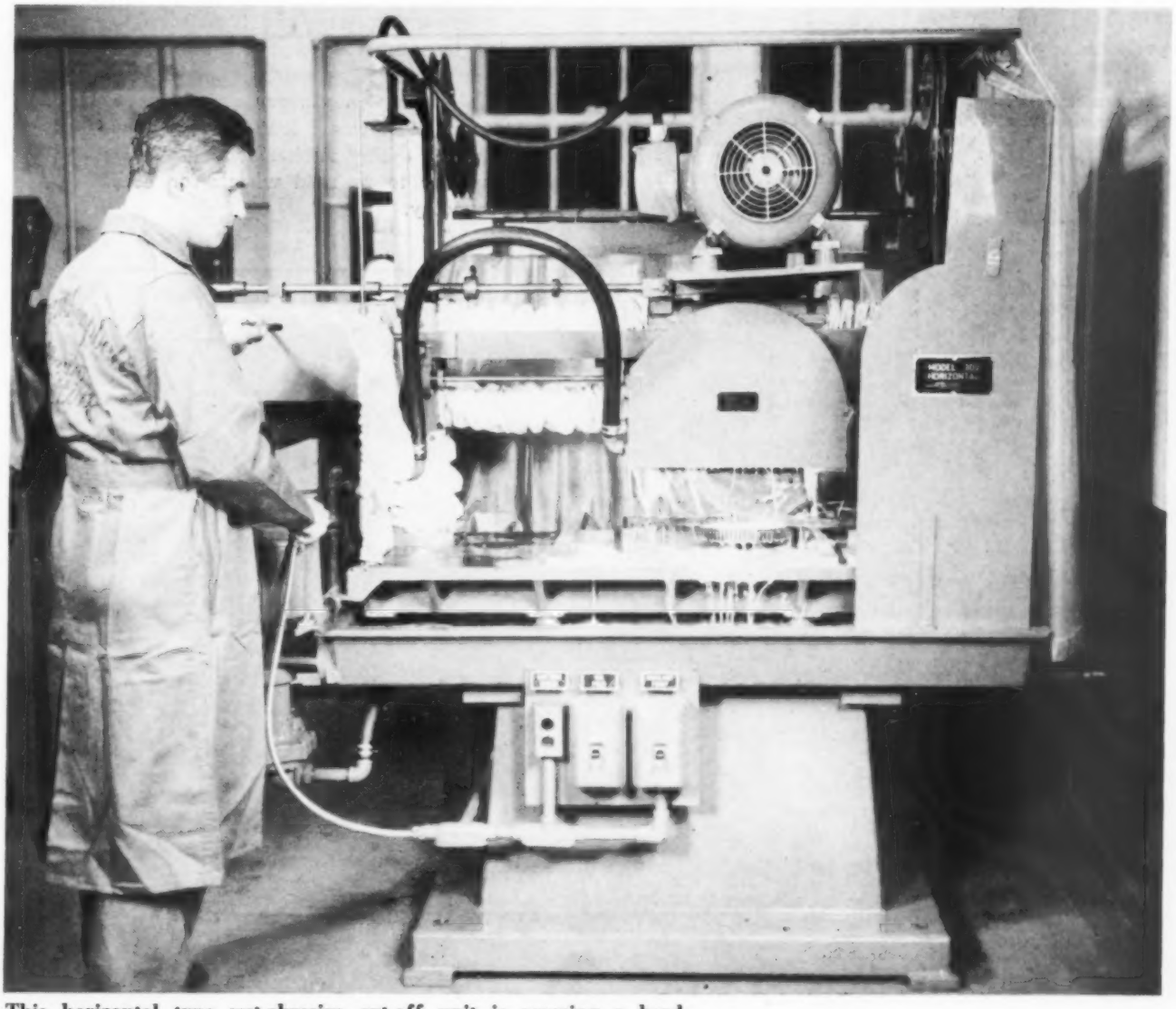
### ABRASIVE CUTTING METHODS

Abrasive cutting falls into two classifications — dry and wet. The correct choice between these two methods depends upon the type of material to be cut, the importance of speed of cut, the degree of accuracy and the quality of finish required. Dry abrasive cutting is basically a fast cutting process best suited to those jobs where subsequent finishing operations do not require an exceptionally high quality of cut. Wet abrasive cutting is not quite so fast a cutting process as dry cutting. However, the use of liquid coolant

***Abrasive cutting is the technique and process of severing a piece of material by means of a rapidly revolving, relatively thin abrasive wheel. The amazing speed with which an abrasive wheel cuts may perhaps be best understood if we consider it as a device which presents thousands of miniature cutting tools to the work in rapid succession. These cutting tools are abrasive, generally aluminum oxide or silicon carbide.***

# CUTTING

This relatively small dry-abrasive cut-off machine, the Allison-Campbell Model 1-A Sever-All, provides for manual oscillation of its 12-in. diameter abrasive wheel to cut solids up to 2-in. square.



This horizontal type wet-abrasive cut-off unit is severing a hardened steel gear for metallographic inspection. Similar machines have been built to cut steel plates and slabs up to 20 feet in length.

reduces heating to a minimum and makes it possible to produce a fine quality, burn-free cut, within good dimensional tolerances.

**Dry Cutting**

Machines generally available for dry cutting offer a wide range of capacities, up to, and including 4" square solids and 8" structurals. Some specially designed machines have somewhat larger cutting capacities. They are generally of simpler construction, and therefore less expensive than wet cutting machines of similar capacity. In view of this lower initial cost, a careful study of the advantages and limitations of dry cutting should be made to determine whether or not the desired results can be obtained by this method.

Dry cutting is fast. For example, it takes only 15 to 20 seconds to cut a 3" diameter bar of hardened steel. Most materials should be cut at the rate of 2 to 5 seconds per square inch. Faster cutting rates will cause greater wheel wear and thus increase wheel costs. Cutting too slowly will cause the edge of the cutting wheel to glaze; quality of cut will be poor and excessive wheel pressure will be required.

The majority of dry cutting operations are performed with resinoid-bonded wheels. Resinoid wheels, because of their faster cutting action, save enough on labor costs so that the cost of dry cutting is frequently lower than that of wet cutting.

The prospective user should also take into consideration the cost of subsequent operations required to finish the cut-off piece. Maximum wheel life and fast cutting action are obtained with resinoid wheels of relatively coarse grit and hard bond. Such wheels will sometimes cause considerable burr, discoloration and surface hardening.

If the cut-off piece is to become part of a welded assembly, these factors may not be objectionable. If surface hardening would complicate subsequent machining operations, or if the presence of burr is objectionable, the added cost of finishing dry-cut pieces as compared with wet-cut pieces may more than offset the savings effected in the cutting operation.

In many cases, burr and surface hardening may be substantially reduced or entirely eliminated by using wheels of finer grit and softer bond, although somewhat less wheel life must be accepted.

For many tube-cutting operations, it is desirable to cut dry, but burr must be kept to a minimum. Fine grit resinoid-bonded wheels, especially developed for tube cutting, may provide satisfactory quality and economical wheel life. However, for extremely thin-wall tubing, rubber bonded wheels will prove superior to resinoid wheels for both quality and economy.

**Large metal chips produced by the dry abrasive cutting process, and viewed under a microscope, appear to be re-solidified globules of molten metal. High speed motion pictures of the dry cutting action indicate that actual "chips" are cut, but they melt after leaving the cut because of the heat generated during cutting. Magnification is approximately 40X.**

The speed of wheel rotation for dry cutting is in a higher range than for wet cutting. Speeds of from 10,000 to 16,000 sfpm are recommended for most dry cutting operations. Speeds in the lower end of this range are desirable when cutting material of large cross-sections. The speeds at the upper end of the range are suitable only for cutting small cross-sections such as speedometer cables. brake cables, and mine bits. Speeds above 16,000 sfpm are likely to cause wheel breakage, and are not sanctioned by the Safety Code.

**Wet Cutting**

Wet cutting machines, of which there are a number of excellent designs available, are equipped with coolant tanks and circulating pumps which deliver a large volume of coolant to the wheel and the work in order to dissipate the heat generated by cutting.

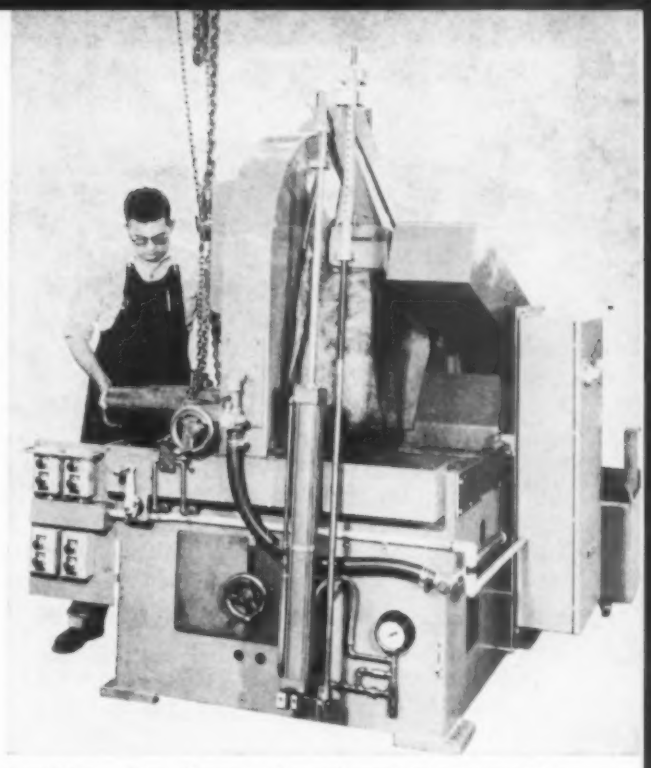
The ideal coolant, from an abrasive cutting viewpoint, is plain water. However, for practical purposes, a small percentage of soluble oil or chemical rust inhibitor should be added to retard corrosion of machine parts and work pieces.

Proper coolant application involves three requirements:

1. Volume of coolant flow, rather than pressure, must be kept at a high level for maximum wheel life.
2. For burn-free cuts, coolant must be accurately directed to the point of contact between wheel and work, because this is the point at which most heat is generated.
3. Coolant must be applied equally to both sides of the wheel. Otherwise, the wheel will wear to a chisel-shaped edge, and crooked cuts and wheel breakage will result.

Wet cutting, using rubber-bonded wheels, offers economical wheel life and fine quality cuts on almost any material. Rate of cut is approximately 4 to 10 seconds per square inch of material cut. Proper wheel selection will completely eliminate burning. Burr, if any, is light and easily removed. Some wet cutting machines provide wheel guides consisting of carbide-tipped slugs supported by rigid brackets. They can be adjusted accurately to close tolerances with the wheel. By guiding the wheel, as it begins to cut, they assure more accurate cutting action.

For many wet cutting operations, wheels with radial holes are recommended. Radial holes carry coolant deep inside the cut itself. This extra cooling action assures clean cuts and maximum wheel life on solids from 2" to 12" round or square. These holes also impart a self-dressing action to



**Loading a 6-in. diameter bar of steel into an oscillating type, hydraulically operated wet abrasive cutting machine. Heavy-duty devices of this type have the capacity to cut solids and structural shapes up to 12-in. by 12-in.**

**Chips from wet abrasive cutting are much smaller than from dry cutting and bear less evidence of having been subjected to high temperatures. This illustrates why dry cutting is suited to high speed cutting where exceptionally high quality cuts are not required, and why wet cutting, while somewhat slower, offers better quality cuts. Magnification is approximately 40X.**

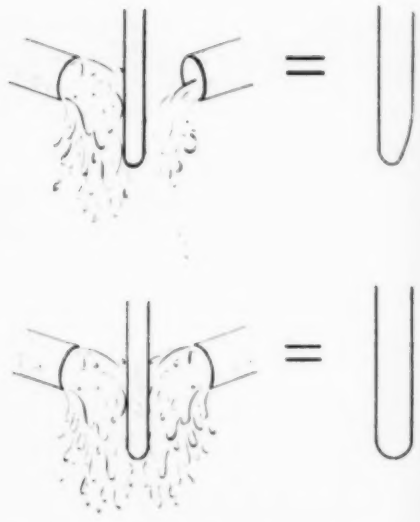
# HOW AND WHY OF ABRASIVE CUTTING

the wheel, keeping sharp abrasive grit exposed for cool, fast cutting. Radial holes are not recommended for those wheels used to cut tubing, structural shapes, or small solids which present a small arc of contact to the wheel. Here, the added dressing action is not required.

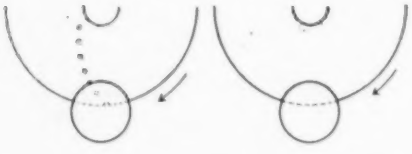
In wet abrasive cutting, the abrasive wheel should be run at speeds of 6,000 to 9,500 sfpm. Experience has shown that speeds in the lower portion of this range will, in most instances, give better quality cuts, held within closer tolerances. Many recently designed abrasive cutting machines run at these speeds and many earlier models have been modified to conform to this practice.

**Submerged Cutting**

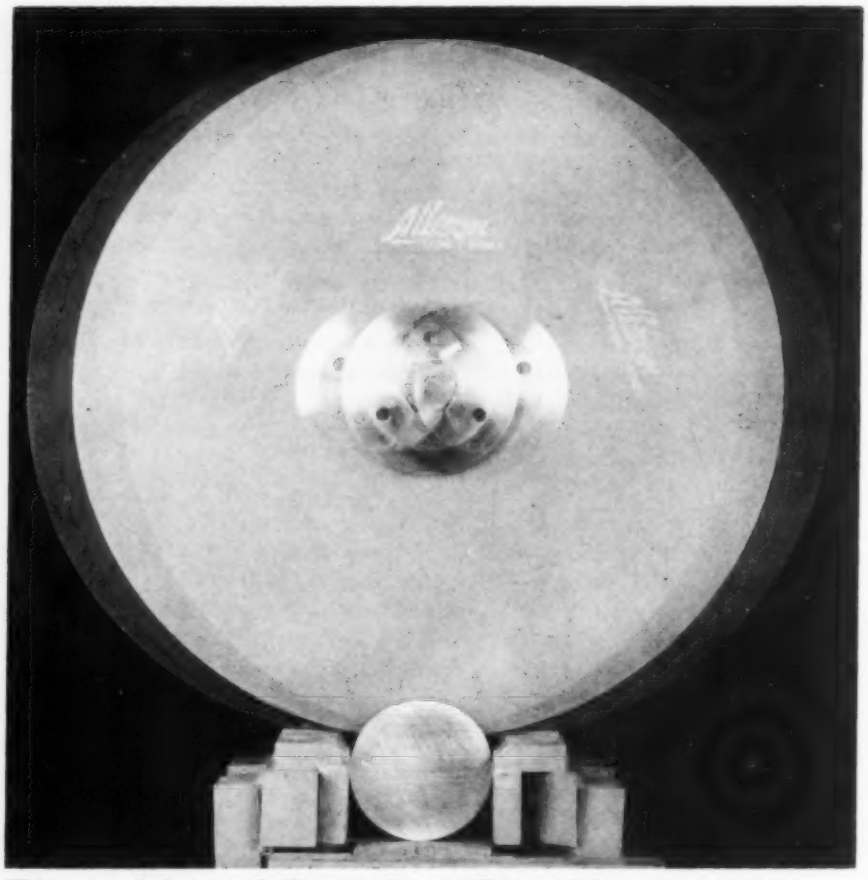
For the ultimate in cooling effect, some machines are designed to make cuts while the material is completely submerged in coolant. Widely used



**In wet cutting, it is essential that an equal amount of coolant be directed at both sides of the cutting wheel as shown in the lower portion of the sketch. With unequal distribution of coolant, the wheel will wear to a "chisel" shaped edge. This will eventually cause the wheel to drift as it cuts, and result in crooked, burned cuts and wheel breakage. Equal coolant distribution produces a symmetrical wheel edge and assures straight cuts.**



**Radial holes in wet cutting wheels, as shown to the left, carry coolant deep inside the cut, and impart a self-dressing action to the wheel when cutting large diameter solid bars. Radial holes are, however, not recommended for the cutting of thin-wall tubing, where the arc of contact is small, and the self-dressing feature is not required.**



**This unusual photograph illustrates how oscillation of the cutting wheel breaks the arc of contact between the work and the wheel. In wet cutting operations, it allows more coolant to enter the cut, allows chips to escape more easily and provides for cooler cutting.**

**The sketches prove that oscillation of the cutting wheel breaks the arc of contact between wheel and work. Oscillation provides cooler cutting of large materials by permitting more coolant to enter the cut and allows chips to escape more readily.**

by metallurgists, submerged cutting produces metallographic specimens which require little or no further treatment before examination.

## TYPES OF ABRASIVE CUT-OFF MACHINES

Whether it be dry, wet or submerged type of operation, all abrasive cutting is performed on four basic types of machines: the chopstroke; the oscillating; the horizontal; and the rotary. Most of these units are available for manual, semi-automatic, and fully-automatic operation.

### Chopstroke

The chopstroke machine is the most common type of abrasive cutting device and is utilized primarily for bar cutting. It has its wheel spindle mounted on a swing-arm which is pivoted at the rear of the unit. The wheel is pushed down through the work by depressing the pivot arm. This operation is performed manually on most models. In this type of unit, wheels as large as 20″ in diameter can be accommodated. Capacity of the unit is approximately 2″ diameter solid material and 4″ diameter tubing.

### Oscillating

The oscillating type of cut-off machine overcomes the capacity limitations of the chopstroke unit, and permits the cutting of solid sections up to 12″ round or square. This type of machine makes provision for the wheel to be oscillated back and forth in the plane of the cut as the wheel is fed downward.

Oscillation reduces the arc of contact between wheel and work and permits large cross-sections of material to be cut without excessive wheel feed pressure. In addition, it permits more coolant to enter the cut and allows chips to escape more readily. The benefits obtained are longer wheel life, faster cutting, greater accuracy, and better quality of cuts. Machines employing the oscillating principle are available for use with wheels of 12″ to 34″ in diameter.

### Horizontal

There are two versions of this type of cutter. In one, the work is clamped to a stationary horizontal table and the cutting wheel is traversed through the work. In the other, the wheel is mounted on a fixed spindle and the work is fed into the wheel on a movable horizontal table.

The latter type is generally of small capacity and is widely used for cutting glass and nonmetallic materials, as well as small metal sections. The majority of these machines use a 12″ or 14″ diameter by 1/16″ thick wheel.

The traversing wheel type is found in medium and large capacity machines, utilizing wheels up to 26″ in diameter. Such devices are utilized for cutting plates and slabs and other shapes which are not practical in bar-cutting machines. The work is clamped to a stationary table and the wheel is traversed through the work. Greatest accuracy is obtained by the increment cutting technique in which the wheel is repeatedly passed across the work and fed downward at the end of each stroke, until the work piece is severed. This method is well adapted to laboratory cutting of large irregular shaped metallographic specimens.

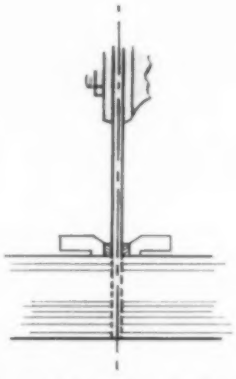
### Rotary

The rotary type machine provides for the efficient cutting of large diameter solids and tubing by rotating the work. Because the work is rotated while the cut is being made, it is only necessary for the wheel to penetrate to the center of a solid bar to completely sever it. This permits the cutting of much larger material than would otherwise be possible with the same diameter wheel.

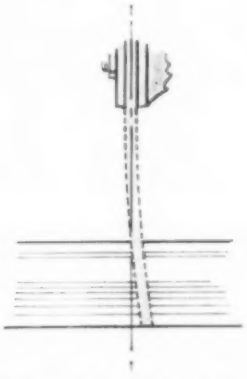
The advantage of this method for cutting large diameter tubing is obvious, as the edge of the wheel need only pass through the wall thickness to complete the cut. This allows the use of wheels down to a very small diameter stub and provides maximum wheel economy. Burr on the inside of tubing is light, and there is no burr on the outside of the cut.

Rotary machines now in use are capable of cutting round bars and tubing up to 14″ in diameter. • • •

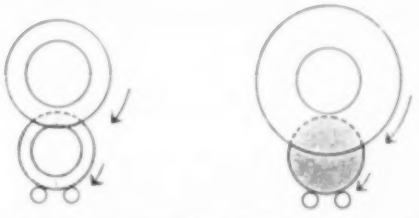
**This is the first of a two part series. The second part will appear in the June issue and will cover work holding, abrasive cutting wheels, case histories and recommendations.**



**As shown, carbide-tipped wheel guides will assure that the wheel begins to cut in the proper location. Closer tolerances can be held, faster cutting can be used without loss of accuracy.**



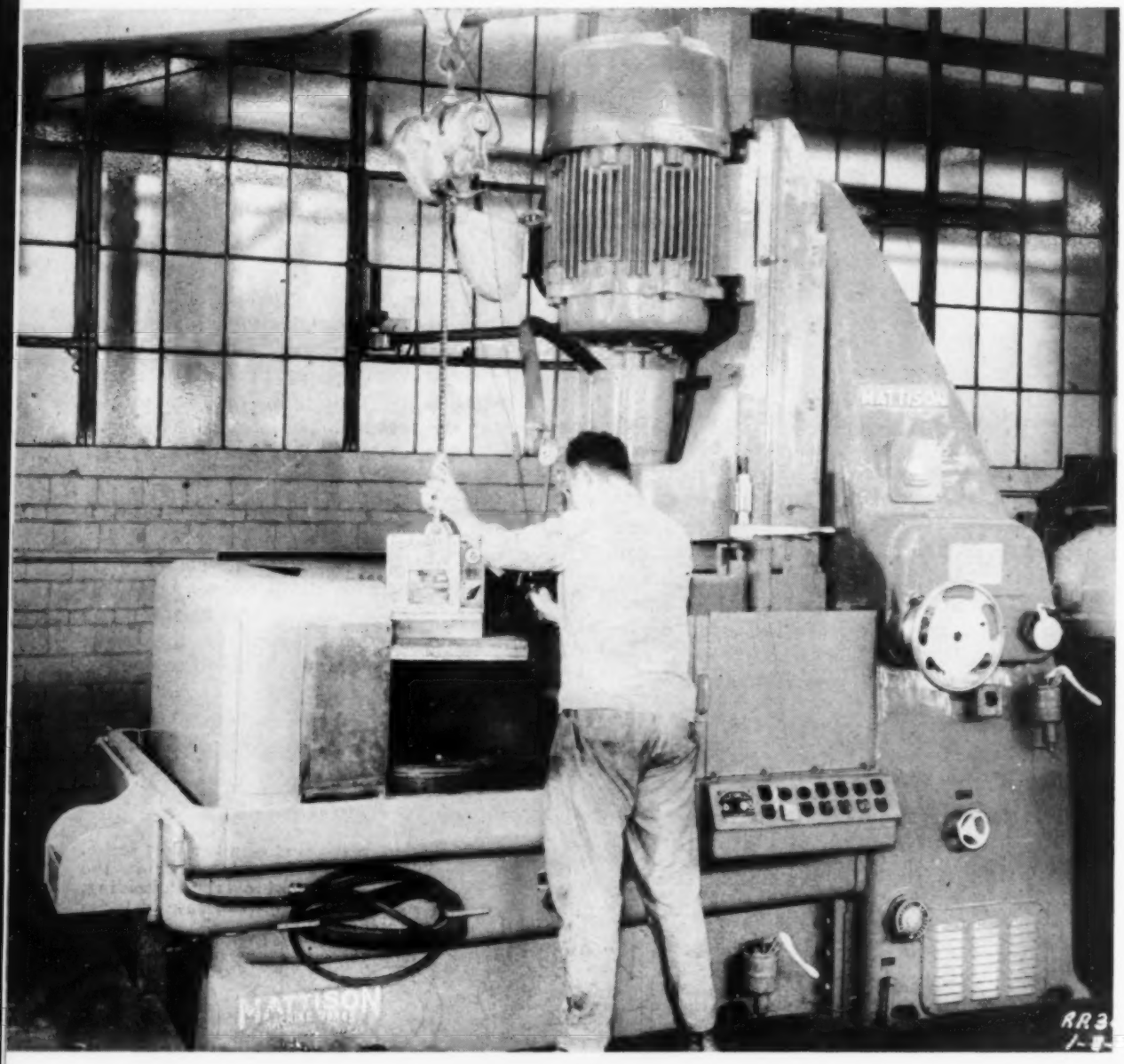
**Occasionally, the cut-off wheel may "skid" to the right or left before starting to cut. If this happens, the cut will be crooked, and may be burned. Wheel breakage may result.**



**Rotary cutting offers maximum wheel economy when severing round bars or tubing. A wheel can be worn to a very small stub diameter because it need pass only through the wall thickness of tubing, or penetrate to the center of a solid bar to complete the cut. Other benefits are greater accuracy and absence of external burr.**

Fine finish produced by surface grinding added new sales appeal to Clearing presses. Stock removal varies from .040" to .060".

Clearing Machine Company switched from cutter-type machining to rough surface grinding for finishing hot-rolled steel press parts. Cutter breakage caused by burnt edges and excessive machine downtime were eliminated.




This 60-hp vertical-spindle rotary surface grinder replaced milling and finish grinding to produce flat cold-rolled steel press parts at Clearing Division of U.S. Industries, Inc. Simplicity of holding the pieceparts and ability to cut through outerscale and burnt edges without cutter breakage accounted for major cost reductions in a program aimed at eliminating hidden costs.

# HIGH POWERED SURFACE GRINDING REPLACES MILLING

● Clearing Division of U. S. Industries, Hamilton, Ohio, started a plant-wide program to reduce hidden costs and improve profits, focusing a special economic eye on tooling, setup fixtures, and even basic processes. One dividend of this program came from the company's recognition of high-powered surface grinding as a stock-removal method which avoids many of the unnecessary costs considered "normal" in the conventional approach to flat machining.

Press parts, formed by flame cutting from hot-rolled 1015 steel plate, formerly were slab milled and then finished on a light duty surface grinder. The great number of different press parts machined by this basic process made rehandling of the work, complex setup on a milling machine, and cutter breakage due to burnt edges and hard outer scale three major targets of Clearing's cost cutting program.

Surface grinding, because of its inherent advantages in loading and unloading, ability to cut through hard outer scale and burnt edges without tool breakage, and potential to combine roughing and finishing operations in one machine, was evaluated in terms of horsepower and stock-removal capabilities. As a result, these parts are now being produced on a 60-hp vertical-spindle rotary which removes stock at the rate of 7½ cu. in. per minute, cutting through .040" to .060" of hard scale and burnt edges without danger of tool breakage.

In addition to the three-fold saving realized by this switch in methods, the use of self-dressing grinding wheels eliminated all machine downtime for servicing the "cutting tool." Finish and accuracy of the parts after surface grinding are so superior to that of former methods used, the advantage has become a selling point on Clearing presses.

The surface grinder, manufactured by Mattison Machine Works, Rockford, Illinois, is more than a ton heavier than the surface grinder formerly used by Clearing for finishing after milling. This machine, with its one-piece vertical column extending all the way to the floor, rigid four-point suspension of the wheelhead, fully truss-ribbed bed, and extra-heavy way construction, is designed to take heavy stock-removal cuts without deflection or vibration. Up to 60 hp is furnished to the high down-feed spindle, which pulls up to 90 hp during intermittent overloads. When full power is applied to a coarse, open-structure wheel, maximum grain penetration is produced at the leading edge. This prevents heat generation and wheel loading caused by insufficient pressure per wheel grain, and reduces more hidden costs.

Proper selection of grit size and wheel bond by Clearing tool engineers gave them the optimum combination of wheel breakdown and wheel life. The self-sharpening action that results from dull grits being torn from the bonding material automatically provides the same economic advantages that are gained from throwaway insert tools. Thus, stock-removal rates can be controlled, in accordance with machine-hour and labor costs, to balance wheel depreciation costs directly. No wheel servicing or machine downtime costs for tool changing are involved, as with cutter-type machining. The type of wheel used at Clearing has quick-change segments, which help keep all tool change downtime in the new process at the very minimum.

The Model No. 36 Mattison machine has a separate coolant tank, which eliminates the problem of heat build-up in the table. The highly detergent grinding fluid, cleaned by a Barnes Drill separator, helps keep the wheel open and free-cutting.

The 42" diameter magnetic table simplifies workholding. A Sundstrand magnetic chuck on an electric hoist facilitates loading and unloading, avoids dropping heavy parts on the table, a frequent occurrence when hooks or other mechanical devices are used.

After a year of production surface grinding, Clearing reports that the original aim of the change-over has been achieved—reduction of hidden costs associated with cutter-type machining. Heavy stock removal on the grinder has more than proved itself to be an economical method of producing flat steel bolster plates, lock plates, and eccentric straps for large presses. • • •

**Burnt edges produced by flame cutting reduced cutter life. Heavy stock-removal cuts were necessary to get under the hard outer scale on hot-rolled steel press parts. Grinding wheel cuts at 7½ cu. in. per minute without danger of breakage.**

# WHY HONING?

## Part IV

In this, the final part of the honing series, is described how to apply honing and the errors, corrections and pitfalls which may be encountered. Also included are a buyer's guide and brief reports on some unusual honing applications.

By M. M. PATTERSON
Managing Editor

● The first three parts of the series covered fundamentals, types of applications, machines, tools, stones and coolants. This part, starting with how to apply, will cover each area in which problems arise and briefly explain what to look for. In this way, some trouble may be avoided or at least recognized or localized. In this short amount of space, it is not possible to solve all the problems with their various ramifications, but it will point to many and give direction to solution.

To provide basic information and thus keep the discussion as clear as possible, generally only internal honing of bores will be covered.

First, the condition of the part should be considered. Although honing should always be looked on as a stock removal operation, the amount of stock removal will affect the cost, time and final condition which can be obtained by any one abrasive. The stock left for honing should be sufficient for correcting the errors and yet as little as possible to reduce the time of the operation. Condition of the surface will also affect honing and should be considered for type of stone and amount of stock left in the bore.

### HOW TO APPLY

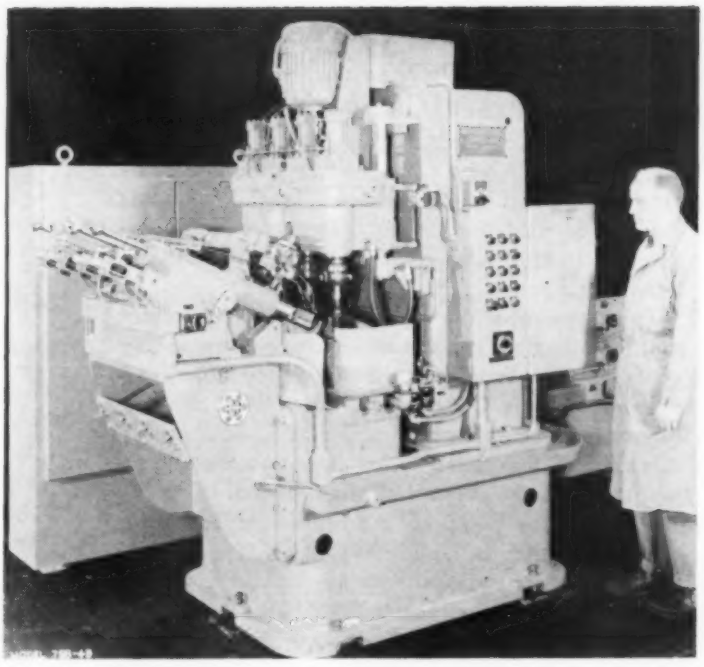
As mentioned before, length of the bore if short in relation to the diameter may require special treatment. This may be overcome by stacking the parts or by using guides in the tool on either side of the stones which would prevent the tool from bell mouthing the part. In these cases, the tool may also be rigid and the part floated in the fixture. Longer bores will require stones in tandem so that more abrasive is presented to the work.

Stone length should be ¾ the length of the bore. The most ideal situation is to stroke the tool in the bore so that 1/3 the stone passes out of the bore at each end. When the stones reach the end of the stroke, their length should not over-lap the position of the stones when they are at the other end of the stroke.

Width and number of stones depend on the diameter of the bore and design of the tool. That is, each tool manufacturer has design features which they feel influence the width and number of stones.

Special consideration must be taken for certain conditions found in the bore. Stones are present in the tool as close to the end of the tool as possible for blind end conditions. Extra guides or special arrangements of stones (spiral stones for example) are used to bridge ports or interruptions in the bore.

Finish requirements are a function of the stone as is the amount of stock to be removed. Basically, if the stock removal is large and the finish requirements are fine, two or more grit and grade of stones will be needed to accomplish the work. Consideration in these cases should be made for



**Shown above is a Micromatic Hone Corp. machine which is designed for the unusual Microhoning application on ball studs. Stock removal is approximately .002" with an accuracy of .0003" and a finish of 6-10 rms. Feed of abrasive and work to fixture is automatic as well as stone wear compensation and cycle.**

spark out time which may provide for the use of only one stone where two have been used. Spark out time is the time during which the stones pass over the work without pressure after the bore is to size. A check should be made to find if the spark out time required to obtain the finish exceeds the time to change stones and inconvenience of stocking more than one stone for the job.

Stone life is, of course, an important function of the economics of the honing process. Because of the relative closeness of tolerances and fine finishes which are obtained, stone life must be carefully evaluated in relation to their application. The extreme conditions of honing require that the selection of stones be carefully made from stones which are finely graded.

Holding parts to be honed can be very critical. This is emphasized in the case of thin walled parts. Any pressures which are induced during the honing operation will distort the finish size of a thin walled part. The ideal fixturing of these thin walled parts would be end for end or floating with rotation prevented by restriction of an extension of the part if this is possible.

The design of the part as far as wall thickness will have an effect on results. In cases such as cylinders of motor blocks variation of the wall thickness will cause difficulty in honing a straight bore with high pressure. High pressures result in "breathing" of the thinner section as compared to the thicker sections. As indicated, lighter pressures will relieve this situation; however, redesign of the part may be best, as some production loss will occur with lower pressures.

Material which is being honed is also a function of the stones. It should be noted, however, that here again because of the accuracy of this operation, slight variation in the material will cause problems of stone life and finish.

The machine action will, of course, affect the honing operation. Except for the hand stroked machines, the length of stroke is controlled by the machine and this setting will affect the bore shape. If the stroke is too long, the end will become "bell-mouth" or tapered large at that end. The reverse is true if the stroke is too short. Most honing machines are designed to provide short stroking of the tool. This enables the operator to run the tool over a short area of the bore to hone out excess stock. For blind end bores, some machines provide a dwell which enables the tool to remain at the blind end and thus the stones hone as long at the blind end as over the rest of the bore. For manual stroked machines, the operator can accomplish these adjustments.

Stone pressure is usually controlled by the machine and will affect stone action described above as well as stock removal. Changes in the feed pressure are related to many other variables and must be carefully adjusted with these variables.

Coolants can often be a source of many problems. Most will be found to stem from contamination. Clean coolant is a must with any close tolerance operation and of course even more so with jobs that require fine finishes.

Slight changes in the viscosity of the coolant can be made to correct some situations. Increasing the viscosity will correct stone glazing and loading, provide rougher finishes and slow stock

**Another unusual application is the raceway Microhoning performed on this machine. Three spindles hone the raceways by providing a stroke which pivots around the center of the raceway.**

removal. It should be noted that contamination can be by machine oil leaking into the coolant which changes the viscosity and causes corresponding problems.

### UNUSUAL HONING APPLICATIONS

Honing has not been restricted to just cylindrical shapes. As mentioned I.D. and O.D. honing of cylindrical shapes are common applications for honing, but recently other shapes such as internal and external raceways and ball studs have been honed.

Raceways are honed to provide quieter running, longer lasting bearings through the ability of honing to improve concentricity between raceway and bore, remove humps in raceway and true the plane of the track, correct track curvature for greater degree of contact with balls and simultaneously improve accuracy and surface finish. Micromatic has pioneered in this field with a machine that is set up so that the Microhoning abrasive pivots about the centerline of the raceway to generate a true radius while the race is rotating. During the final seconds of the cycle, the speed of the abrasive oscillation is reduced so that the finish has its lay pattern running with the raceway.

Another example of unusual application is the honing of ball studs. In this set-up, the studs are placed in a slightly tilted position with the abrasive being a concave shape to cover about 1/3 of the circumference of the ball. The ball stud is then rotated as is the abrasive which is fed down into the stud. The combination of movements provides the cross-hatched pattern which is so important in honing for finish and self-dressing of the abrasive. This was also a Micromatic Hone Corporation development.

### GENERAL SUMMARY

In any honing installation, there are eleven variables that can be adjusted to correct any condition that may be encountered. In the following chart these variables are tabulated and their relationship to the most common undesirable conditions is indicated.

The purpose of the chart is to help an operator make minor adjustments made necessary by changes in material or other uncontrollable variables in the job. Only one change should be made at a time and its effect noted before making others. A study of the chart indicates how each adjustment affects the other conditions listed.

The chart is based on the following: 1. Honing abrasives must be self dressing. 2. The coolant not only carries away heat, but it must also keep the abrasive flushed clean. 3. Theoretically, the best dressing action is obtained when the included angle of the cross hatch pattern is 90°. However, seldom is it possible or practical to reciprocate the head fast enough to obtain this condition. Increasing the reciprocation speed or decreasing the R.P.M. tends to bring the cross hatch pattern closer to the ideal. • • •

**We wish to gratefully acknowledge the following companies who supplied information and cooperated in the development of this series: Barnes Drill Co.; C. Allen Fulmer Co.; Jes-Cal Co.; Micromatic Hone Corporation; Mid-West Abrasive Co.; Sunnen Products Co.**

| | ABRASIVES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CONDITION | FRIABILITY + means more friable grain | GRAINSIZE + means finer grain | HARDNESS + means harder grade | STRUCTURE + means more open structure | FEED PRESSURE | RECIPROCATION | R.P.M. | COOLANT VISCOSITY means more viscous mixture | RUNOUT TIME | STROKE LENGTH |
| ABRASIVE GLAZING | + | −* | −* | + | +* | +* | −* | + | − | 0 |
| ABRASIVE LOADING | 0 | −* | − | − | +* | + | −* | + | 0 | 0 |
| TOO ROUGH SURFACE FINISH | 0 | +* | +* | − | − | − | +* | − | + | 0 |
| TOO SMOOTH SURFACE FINISH | 0 | −* | −* | + | + | + | −* | + | − | 0 |
| POOR STONE LIFE | − | + | +* | − | − | − | + | −* | 0 | 0 |
| W STOCK REMOVAL | + | −* | − | + | +* | +* | −* | +* | 0 | 0 |
| TAPER—LARGE AT ENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | − |
| TAPER—SMALL AT ENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | + |

* = Have greatest effect  0 = No effect  − = Reduce or eliminate  + = Increase or addition

# BUYERS GUIDE FOR HONING EQUIPMENT

## BARNES DRILL CO.

### Vertical Machines

MODEL 10—capacity 1½", spindle travel 2½", swing 10", lift out stroke 6", reciprocation and rotation motor ¾ hp, sizing, automatic feed and fixturing.

MODEL 224—capacity 6", spindle travel 15", 25", or 40", swing 12", reciprocation 3 hp, rotation 5 hp, sizing, automatic feed and fixturing optional.

MODEL 307—capacity 7", spindle travel 25", 30", 35", 45", or 60", swing 15¼", reciprocation 5 hp, rotation 7½ or 10 hp, sizing, auto. fd. and fixturing.

MODEL 320—capacity number of spindles or cylinders 3, 4, 6, or 8, spindle travel 20", swing 16¼", reciprocation 15 or 20 hp, rotation 20 or 40 hp, sizing, automatic feed and fixturing optional.

MODEL 4014—capacity 16", spindle travel 25", 35", 50", 65", or 75", swing 20¼", reciprocation 15 hp, rotation 20, 25 or 30 hp, sizing, auto. fd. and fixturing.

MODEL 8530—capacity 36", length of work 72", reciprocation 20 hp, rotation 40 hp, fixturing optional.

MODEL 4020—capacity 20", spindle travel 70", reciprocation 15 hp, rotation 30 hp, fixturing optional.

MODEL 4030—capacity 30", spindle travel 90", reciprocation 15 hp, rotation 40 hp, fixturing optional.

### Horizontal Machines

MODEL 1—capacity 3", spindle travel 6', 8', 10' or 12', swing 8", rotation 5 hp, reciprocation 5 hp, sizing, auto. fd. and fixturing optional on all horiz.

MODEL 3—capacity 6", spindle travel 8', 12', 16', 20', or 25', swing 12", recip. 7½ hp, rotation 10 hp.

MODEL 6—capacity 10" spindle, travel 8', 12', 16', 20', 25', 30' or 35', swing 18", reciprocation 15 hp, rotation 15 hp to 25 hp.

MODEL 12—capacity 16", spindle travel 10' to 80' in 5' increments, swing 20", reciprocation 15 hp, rotation 15 hp to 25 hp.

MODEL 20—capacity 24", spindle travel 12' to 80' in 5' increments, swing 26", reciprocation 20 hp, rotation 40 hp to 60 hp.

MODEL 30—capacity 36", spindle travel 16' to 100' in 5' increments, swing 31", reciprocation 25 hp, rotation 50 hp to 75 hp.

### Tools

Any size tools including specials, horizontals and external. These will be designed for the applications. Standards are available in the most styles and sizes.

## C. ALLEN FULMER CO.

### Vertical Machines

MODEL 415—capacity 4" spindle travel 15".

MODEL 10 SERIES—capacity 10", spindle travel 25", 36", 48", and 60", automatic feed, sizing and fixturing optional.

MODEL 15 SERIES—capacity 15", spindle travel 36", 48", 60", and 72", automatic feed, sizing and fixturing optional.

MODEL 12 SERIES—capacity 10", spindle travel 25", 36", 48", 60", and 72", automatic feed, sizing and fixturing optional.
(Additional features available on No. 12 not available on No. 10).

MODEL 18 SERIES—capacity 25", spindle travel 48", 60", 72", 84", 96" and 120", automatic feed, sizing and fixturing optional.

MODEL 24 SERIES—capacity 24", spindle travel 48", 60", and 72", automatic feed, sizing and fixturing.
MODEL 30 SERIES—capacity 50", spindle travel 72" to 144" in 24" increments, automatic feed, sizing and fixturing optional.

### Tools

Tools are available for all Fulmer machine applications.

## JES-CAL COMPANY

### Tools

Full range of tools from ½" to 8" for vertical and horizontal honing. Tools feature no universal and include automatic sizing as optional for any honing machines in the field.

## MICROMATIC HONE CORP.

### Vertical Machines

MODEL 738—capacity 1", spindle travel 3", swing 9½", reciprocation and rotation ½ hp, automatic feed, sizing and fixturing optional.

MODEL 739—capacity ⅜", spindle travel 1", swing 8", reciprocation and rotation ¼ hp, automatic feed, sizing and fixturing optional.

MODEL 723—capacity ¾", spindle travel 15", swing 14¼", reciprocation 3 hp, rotation 1 hp, automatic feed, sizing and fixturing optional.

MODEL 728—capacity 12", spindle travel 12", swing 14¼", reciprocation 5 hp, rotation 3 hp, automatic feed, sizing and fixturing optional.

MODEL 737—capacity 18", spindle travel 16", swing 14", reciprocation 5 hp, rotation 5 hp, automatic feed, sizing and fixturing optional.

MODEL 740—capacity 6", spindle travel 40", swing 8¾", reciprocation 5 hp, rotation 3 hp, automatic feed, sizing and fixturing optional.

MODEL 450—capacity 17", spindle travel 50", swing 21", reciprocation 10 hp, rotation 15 hp, automatic feed, sizing and fixturing optional.

MODEL 710-2—capacity 3" (2 spindle), spindle travel 10", reciprocation 3 hp, rotation 2 hp, automatic feed, sizing and fixturing optional.

MODEL 705-2—capacity 1½" (2 spindles), spindle travel 10", reciprocation 2 hp, rotation 3 hp, automatic feed, sizing and fixturing optional.

MODEL 420—capacity large diameters multiple bores, spindle travel 20", swing 16", reciprocation 10 hp, rotation 25 hp, auto. feed, sizing and fixturing.

### Horizontal Machines

MODEL 523—capacity (multiple spindle or single spindle), spindle travel 15", reciprocation 3 hp, rotation 1 hp, auto. fd., sizing and fixturing optional.

MODEL 6120—capacity and spindle travel depending on requirements.

MODEL 150—capacity 1½", spindle travel 12", swing 5", reciprocation 2 hp, rotation 1 hp, automatic feed, sizing and fixturing available.

### Tools

All ranges and types including specials, external and horizontals. These will be designed for the applications. Standards are available in the most common styles and sizes.

## MID-WEST ABRASIVE COMPANY

### Tools

Spiral tools ranging from 2" to 20". Length based on application with stone lengths from 2" to 8".

## SUNNEN PRODUCTS COMPANY

### Hand Reciprocation Machines

MODEL MBB-1290 D—capacity 2⅝", length of work ⅛" to 18", rotation ½ hp. Feed control included and fixturing available.

### Tools

All sizes for hand reciprocation from .100" to 2.625". Also external tools and a full line of portable honing tools for production, maintenance, tool room and salvage.

The above is intended as a guide only. Many features and additional attachments or designs are available which have not been covered. All of the companies listed manufacture special machines for unusual applications or operations of confining nature. In all cases the company representative should be consulted before a decision is made on the model.

It should also be noted that capacity of a honing machine actually depends upon the amount of abrasive in contact with the work; therefore, in many cases the maximum diameter and length cannot be honed on the machine if they appear in the same part.

Abrasive stones are available from all the companies mentioned.

# How To
# Grind Carbide Milling Cutters

**Sharp declines in carbide tool life after the first and subsequent re-grindings are all too common. This article by an authority in the field shows you how to get "like new" performance from carbide milling cutters through their entire useful life.**

By THOMAS HOLLIS, JR., President
Nelco Tool Company, Inc.
Subsidiary of Cutting Tool Division,
Brown & Sharpe Mfg. Co.

● Carbide tipped milling cutters have enjoyed an ever-increasing demand because they cut faster, cut hard to machine materials, and usually last longer than other conventional tools. However, many manufacturers who have adopted carbide for these reasons definitely limit the life of their own tools, very often spoil the cutting characteristics engineered into the tool thereby increasing their production costs and shortening the useful life of the tool up to 5000%. The answer to these "cost of production" wastes is in correct methods of regrinding carbide tipped cutters.

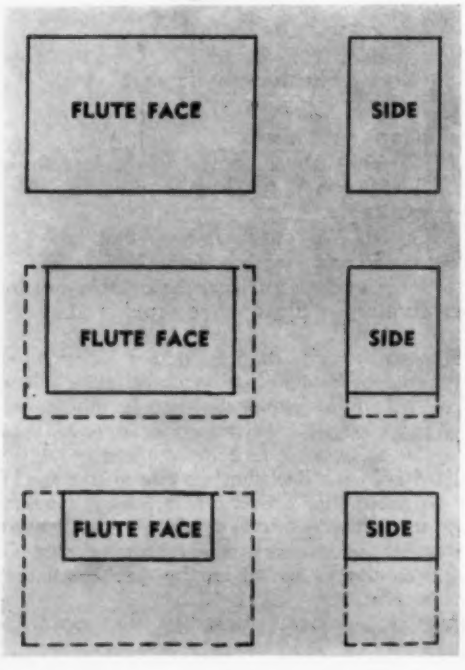
Correct regrinding demands that the flute face (leading plane adjacent to the cutting edge) of a cutter be reground as well as the other surfaces. This leaves the body of the tool in its original condition so that the tool can be retipped several times after the carbide has been productively used up. In addition to this retipping advantage, the tool will produce many more pieces between sharpenings if only the carbide is ground. Snagging away the body or grinding it with a diamond wheel overheats the tips resulting in unnecessary strains being put on the braze and the carbide tip. In many cases when snagging or grinding the body is carried to extremes, chucks of carbide will literally fall out. Figure 1 illustrates some carbide tipped side mills where this unnecessary damage has occurred due to improper grinding. It should be pointed out that the tool body was also destroyed so that there was not much point in attempting to retip it. The cost of retipping a carbide cutter that has been resharpened incorrectly is very often prohibitive and the service to be expected after re-sharpening is definitely limited.

Relieving the body of the tool almost always results in waste of production time, of productive carbide and of a carefully engineered tool body that could, after maximum initial production, be retipped very inexpensively for more production.

Here are the money saving rules for better regrinding:

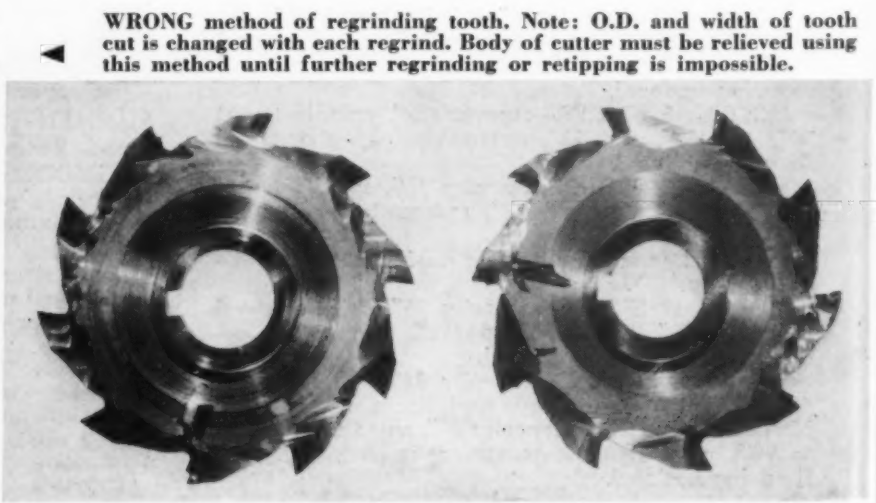
Carbide tipped cutters should be re-sharpened on a tool and cutter grinder. Cutter should be held on the same type mounting as is used on milling machines. A 180 or 220 grit diamond flaring cup

**Figure 1A**

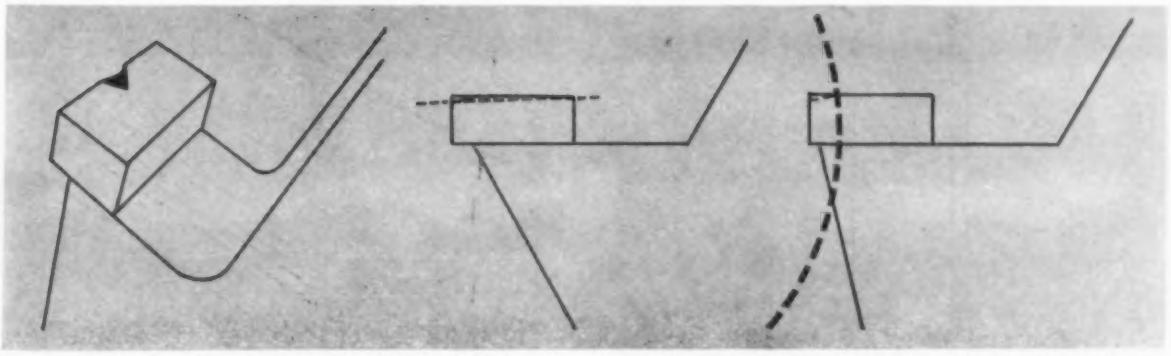



**Top—Original tooth size. Center—Tooth after regrinding. Bottom—Tooth after successive grinding.**

◄ **WRONG method of regrinding tooth. Note: O.D. and width of tooth cut is changed with each regrind. Body of cutter must be relieved using this method until further regrinding or retipping is impossible.**



**A horrible example of how NOT to grind a cutter. The body is destroyed so that it is next to impossible to retip the tools. Figure 1.**



**Damaged (chipped) cutter tooth (left). Problem is to resharpen cutting edge without sacrificing any of the original cutting characteristics of cutter. RIGHT method of regrinding (center). Flute face is ground removing chip but maintaining tip size, clearance and all original cutting characteristics. WRONG method of regrinding (right)—O.D. is changed considerably—tip size is changed—tip is weakened—overhang is destroyed—cutter body is damaged—making additional regrinding or retipping virtually impossible. Figure 2.**

wheel (diamond on periphery) should be used. Maximum stock removal per pass should not be more than .001". Take only one pass on each tooth and go to next tooth.

Experience in regrinding tools, will lead to the discovery that more stock can be removed if surfaces are narrow. It is also possible to take more than one pass as long as the tip does not get too hot to touch. However, for those who are starting, or don't regrind carbide cutters regularly, it is a good idea to stick with the .001" per pass and only one pass per tooth.

The most important operation to perform, and the one usually omitted is to grind the top face or flute face of the tip (See figure 2). Because this operation is rarely done on high speed tools, except in the case of form relieved tools, most cutter grinders do not do it on carbide cutters either.

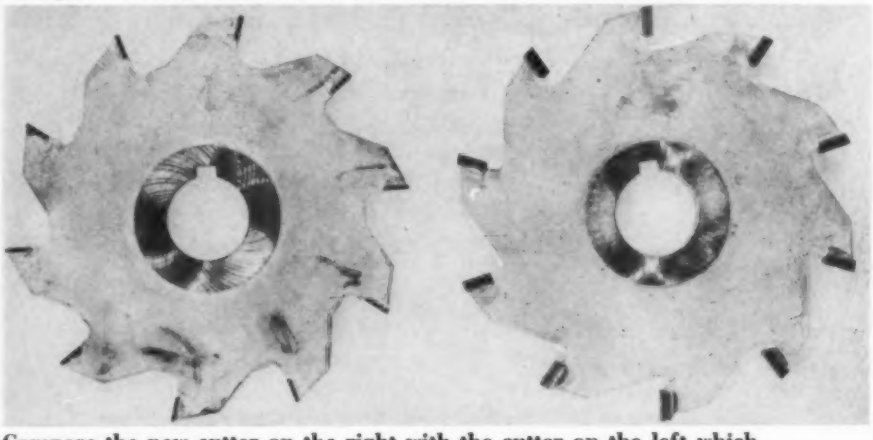
Furthermore, most of the accepted commercial films and instruction books on the subject do not call for this operation. However, if this important step is always performed in regrinding a tool, many of the troubles in carbide cutters are eliminated (see figures 1A, 3A).

Many carbide cutter users report that the first time they use a carbide cutter it works fine, but when they resharpen it they only get 20 to 50% as many pieces. Investigation invariably proves that they are not regrinding the flute face and this is where the trouble lies. The cutter on the right shown in Figure 3 is a new cutter. The cutter on the left is one that has had the flute faces reground many times. It is apparent that the body has not been touched, but the tips are almost completely used up. There is a minimum of wasted carbide and no cracked or broken tips. Yet this tool has performed like new through its entire tip life. In the same manner that the practice of always regrinding the top of a single point tool is generally accepted, it is essential that the same thing be done with a carbide cutter. This is the first operation to be done and it is performed in the following manner:

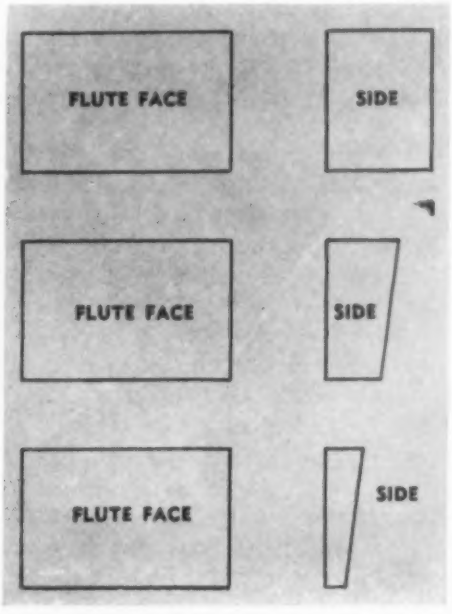
Mount the cutter preferably on an index head. If this is not available use a regular head or an

**RIGHT method of regrinding cutter tooth. Note: Width and O.D. remain virtually the same; thickness of tip is the only dimension that changes—undisturbed cutter body continues to reinforce thinner tooth.** ►

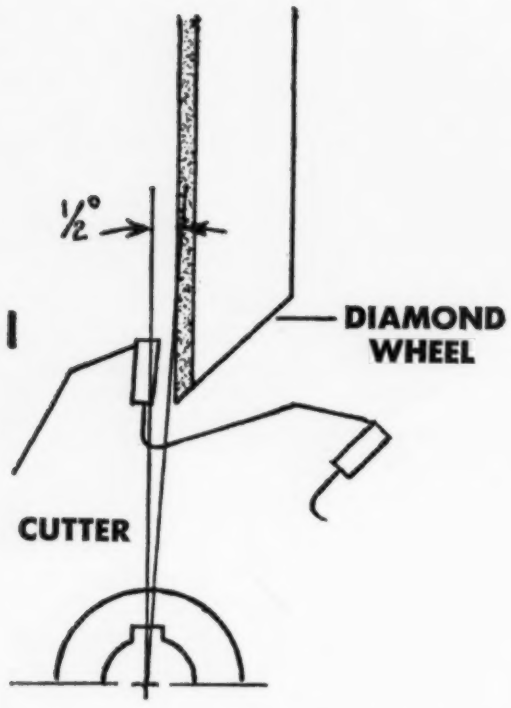
**Figure 3A**

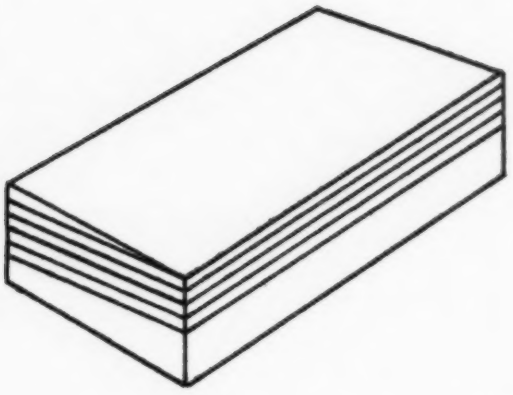


**Compare the new cutter on the right with the cutter on the left which has had the flute face reground many times. You can see that the body has not been touched, but the tips are almost completely used up. This tool has performed like new through its entire life and can be retipped very inexpensively for more production. Figure 3.**




**Top—Original tooth size. Center—Tooth after regrinding. Bottom—Tooth after successive grinding.**



**Tip of carbide cutter showing carbide removed during successive regrinds without changing cutting dimensions of tooth. Figure 4.**

**The proper position of the cutter and wheel to perform the regrinding operation. Figure 5.**

arbor between centers. The flute face should be vertical and parallel with the table. The wheel head of the grinder is then raised high enough so the cup-wheel will pass over the cutter through the gullet. It is a good idea to cock or offset the wheel ¼ to ½ degree. This produces a freer cutting action. Next rotate the top of the cutter toward the wheel ½ degree. In other words, rotate the tooth to be ground forward ½ degree. This will make an easier grinding job and will maintain the proper radial rake angle.

Figure 5 illustrates the proper positioning of the cutter and wheel to perform the operation. If an index head is not available, file the solder flat under the overhanging part of each tip so that tooth rest will accurately position tooth for grinding. On properly designed cutters, there will be an overhang of carbide sufficient so that the tooth rest or finger can be placed under the tip. You are now ready to grind. Remove from .005 to .010 stock in .001 increments, depending on how dull the cutter is. It is not necessary that the whole surface clean up all the way into the gullet. Remove the same amount of stock from each tooth, unless you happen to have one tooth that is badly damaged. In this case, remove more stock from this one tooth only. This will result in the tool being "out of index," but the amount should be very slight and will usually do no harm.

All stock removal should be done by infeed of the table or wheel head, not by rotating the cutter. If a tooth rest is used rather than an index head, check its setting with each tooth.

Once all the flute faces are ground, the remaining operations should be performed. It is necessary to remove only .001" to .003" of stock from each remaining surface if the flute has been resharpened properly. In the case of side mills, it is not usually necessary to regrind the sides if the flute has been ground. However, it may be desirable to touch up the sides to correct for any runout that uneven flute face grinding may have caused.

Grind periphery of cutter. This should be done using a finger. The finger should be 1⅞ times the length of the tip. The top surface should be flat. A carbide tip on top of the finger will simplify the operation greatly. Finger should be set to same angle as axial rake of cutter. It should be attached to spindle head of grinder. Grind primary with wheel rotating into cutting edge. Lower spindle and grind secondary with wheel rotating down. Set clearances using graduations on work head. Use center distance as 0 degrees.

Grind front face or sides. This should be done using a "snap finger" attached to the table or work head. Radial angle of cutter should be level. Tip work head for clearance and turn it for concavity angle. Grind chamfers or radii.

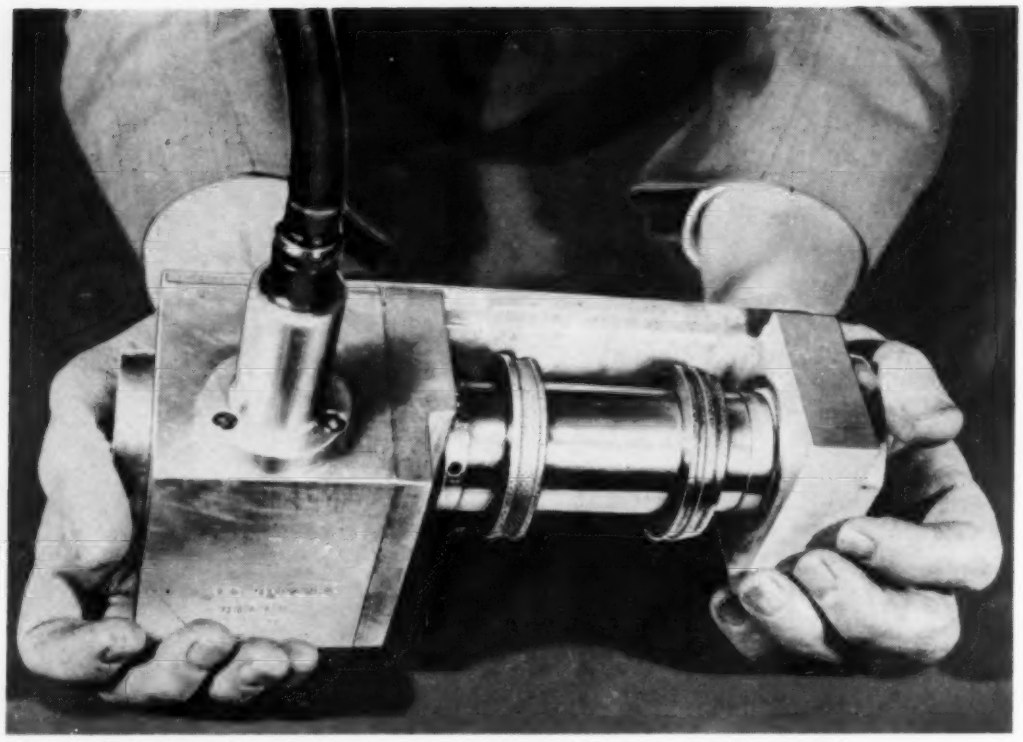
Since the bulk of the regrinding has been done on the flute face, it is never necessary to snag or grind the body of the cutter. The carbide will be virtually used up before the O.D. or sides ever get down to the body. In addition, the time required to grind the flute face is much less than the time consumed to snag or grind the body steel away.

This correct method of regrinding carbide cutters has another advantage with side milling type cutters or with slitting saws; they stay nearer to their original width for a longer time, since it is usually unnecessary to touch their sides. The only loss of width therefore is that created by the clearance angles. This is usually only a few thousandths even if the whole tip is ground away.

The correct grinding procedure may seem complicated at first; it is, however, very simple . . . and, above all, it's a lot cheaper. • • •

# SAM SAFETY says:

*No. 9 of a series* • GRINDING and FINISHING • *A Hitchcock Publication* • *1960*



**The Tru-Grit rotary diamond-set form dressing wheel is powered independently from the grinding wheel. A single dressing unit may combine several rotary dressing wheels to permit simultaneous dressing of several grinding wheels.**

# NEW FORM GRINDING

## Cheaper, Faster, Closer

By HAROLD E. ROBISON
President
Wheel Trueing Tool Company

**Harold E. Robison joined Wheel Trueing Tool Company in 1919 and was appointed Treasurer in 1932. He was elevated to the president's position in February, 1959, succeeding H. B. Wallace, founder and president of the company since its inception in 1910. Wheel Trueing pioneered the development and manufacture of diamond tools in the midwest and is now the largest manufacturer of diamond tools in the Western Hemisphere.**

• A new form dressing method that has kept dimensional tolerances within .0005 of an inch for more than a year, and almost eliminated time formerly spent in dressing tool setup and dressing operations proves to be a single solution for four major form grinding problems. Close dimensional tolerances, "lost" production time, scrapped parts, and cost of dressing tools and grinding wheels are fundamental worries for management in the grinding industry.

The basic idea has been around for a number of years, but until recently its potential has barely been tapped. Every day new shapes and new developments of grinding wheel form-dressing tools are taking the place of former less efficient methods.

The real breakthrough has come with the introduction of the Tru-Grit rotary diamond-set form dressing wheel. The shaped rotary diamond grit wheel gives a greater degree of accuracy and consistency of reproduction throughout the life of the dressing wheel than was possible by any other dressing method. Additionally, applications that never before could be done in a single operation are now not only possible but are practical and more efficient than previous methods.

### ROTARY DRESSING WHEEL

The dressing tool is powered independently from the grinding wheel. This permits greater flexibility in application, finer control and easy adaptability to full automation. Direction of the grinding wheel

in relation to the rotary diamond dressing wheel is relatively unimportant, except that surface speeds may not be identical in the same direction. Dressing is accomplished by abrasive action at full grinding wheel speed, with a resulting gain in production time. Power for the dressing wheel is usually provided by an electric motor through a flexible shaft.

No basic change of the machinery is required to adapt it to the use of the new rotary dressing wheel except a modification of the electrical and hydraulic circuitry to accept the dressing wheel unit. Normally only one unit is required per machine.

The wheel is presently manufactured for forms up to 2" wide for wheels of any diameter. It is possible to dress wider wheels with multiple set up of dressing wheels. This must be under the guidance of a manufacturer's engineer.

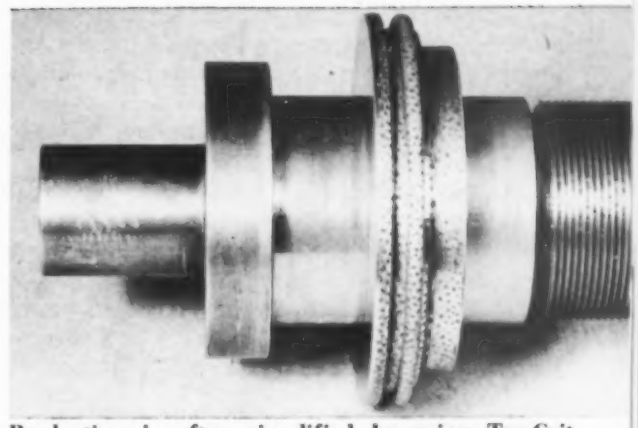
**APPLICATION**

On a valve grooving operation at one automobile plant, four machines had been equipped with three single diamond dressing tools per machine. Original forming of the grinding wheel was a lengthy process. When any one of the dressing tools on a machine wore out or became broken, all three had to be replaced. Cost of a single tool was $20 and an average of six tools per day was consumed on the two shifts. In addition, an hour of setup time was required per shift, an average of two hours stolen from potential production time each day.

After the original forming of the grinding wheel, production continued during subsequent dressing with the 3 single diamond tools. Each dressing took about a minute, and parts that were being ground during that time tended to fluctuate in form as the dressing progressed, resulting in some scrapping or regrinding. An average of 18 pieces per minute were produced. Original forming was accomplished in a fraction of the time, because the entire surface was dressed at one time in comparison to the time required for the 3 single diamond points to traverse the surface.

Dressing with the Tru-Grit wheel requires 2½ seconds and is accomplished "between parts," or in the non-productive parts of the machine cycle in which the part is being ejected and the next part is fed into grinding position. There are no scrap parts as a result of this dressing during production.

Original cost of the Tru-Grit dressing wheels ranged from $600 to $800. This was more than offset by their long life. Under normal work conditions, one diamond grit wheel lasts a year or more, resulting not only in a saving in dressing tool costs but also in elimination of setup time. With two hours of production time per day recovered at an average of 18 pieces per minute, the production potential for the four machines today is increased



**Production is often simplified by using Tru-Grit rotary diamond-set form dressing wheels. Cutoff, chamfering and beveling is accomplished in one operation in the production of a hydraulic needle valve by the use of this tool to dress the single grinding wheel.**

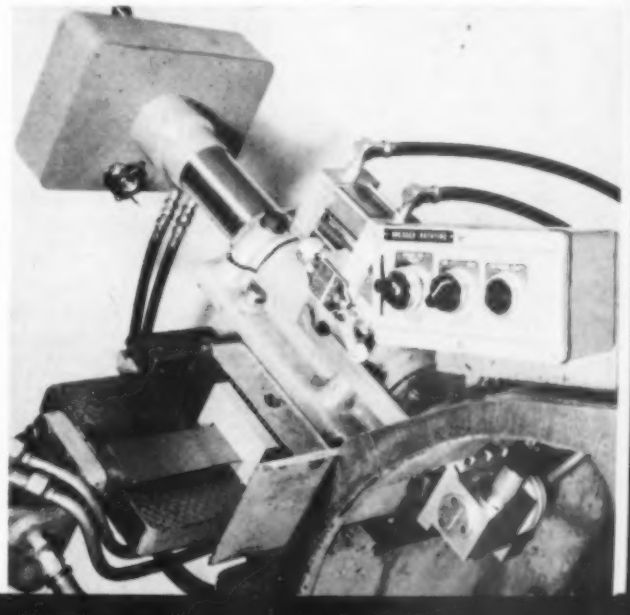
by more than 600,000 parts annually and scrap from variations during dressing has been eliminated.

Uniformity of form in high production operations is the most important single factor contributing to the reduction of parts' costs through the use of these rotary diamond dressing wheels. Tru-Grit wheels are particularly well suited to automation, although just as easily adaptable to manual applications.

Volume controls how often a grinding wheel must be dressed and how long a wheel will last. In an application similar to the one described earlier, life of the grinding wheels was increased 50 per cent by equipping the machines with rotary diamond dressing wheels.

Two spaced grooves were required to be ground into a valve stem at another automotive plant. The old method required two machines, one for each groove. Redressing of the grinding wheels was accomplished with single diamond tools during the time that grinding was being done, contributing to slight variations in the grooves and substantial scrap loss.

Minor alterations were made to the grinding machine to accommodate two grinding wheels and a double-wheel Tru-Grit rotary diamond dressing unit was added. With the modified equipment, both grooves were ground simultaneously on a single machine in 3½ seconds. Dressing of the



**Grinding wheel has been removed to show location of Tru-Grit rotary diamond-set form dressing tool. Power is supplied to Tru-Grit through flexible shaft driven by independent motor mounted on top of grinding machine. Cylinder at upper left controls infeed of dressing wheel. Direction of rotation of dressing wheel in relation to grinding wheel is immaterial, providing surface speeds are not identical in the same direction. Tru-Grit dresses by friction, not by pressure, removing approximately .001 inch of stock during each dressing operation.**

grinding wheel was accomplished during the time that parts were changing. Production was not interrupted nor were parts scrapped because wheels were not dressed during the grinding action of the wheel.

Less stock is removed in each dressing operation to recover the original form as the complete form is developed by the wheel. Thus, the life of the grinding wheel is increased. The rotary dressing tool also gives a uniformity of dressing due to the uniformity of the dressing wheel as compared to single part dressing. The consequent grinding of machine parts or equipment components is to a greater degree of accuracy than ever before.

**SQUARE GROOVING**

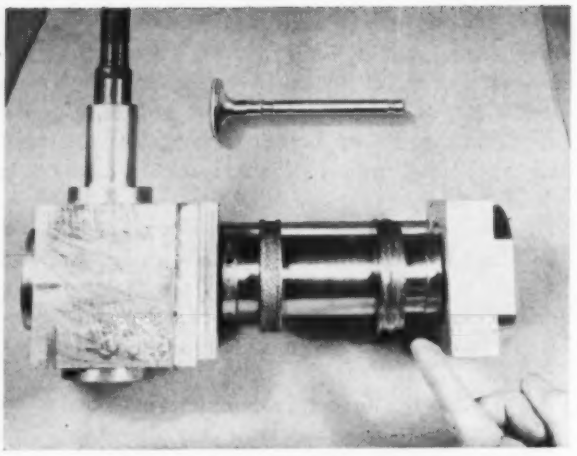
Square grooving is just one more area in which this dressing has provided an answer to a problem. Under old methods, square grooving of some parts was done by machining. Use of the rotary dressing wheels with proper selection of wheel grading can now produce a square groove of 90° corners. The harder and tougher steels used today make the turning operation of yesterday impractical or too costly.

With the introduction of rotary diamond-set form dressing wheels, the grinding of more intricate configurations are possible. More intricate forms often result in combining several dressing and grinding operations into a single operation, with higher volume of production and better uniformity. Users have found that square grooving today is done faster, easier and more accurately with multiple grinding wheels dressed with rotary diamond dressing wheels.

In grooving and forming a part for an airplane engine, a center-type grinder was used with two separate grinding operations. Grinding wheels were dressed by single diamond dressing tools. Crush forming was ruled out in this instance by square grooving and bevel forming requirements.

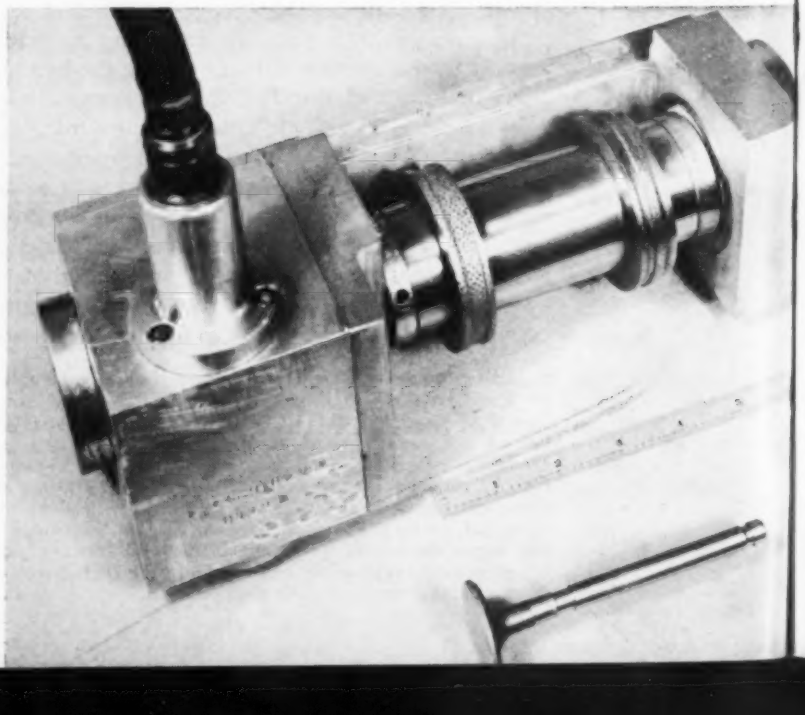
Now, with a single machine, the multiple surface and angle configuration of this complicated part is produced in one grinding and one dressing operation, using a composite Tru-Grit rotary form dressing wheel. The original cost for the Tru-Grit wheel of $600 is greatly offset by long life expectancy, reduced setup time and reduced labor.

The Tru-Grit rotary wheel minimizes or eliminates many of the problems which have been costing grinding departments a good deal of money. It has changed manufacturing procedures because of its speed and accuracy in developing simple or complex forms on any grinding wheel. It eliminates crush roll forming for semi-finish form grinding in many instances and, in processing harder metals, offers the possibility of fast, economical, accurate grinding instead of turning to shape. • • •



**Only one of two Tru-Grit wheels in this dressing unit had to be replaced to accomplish certain engineering changes on one of the two grooves ground into an automotive valve stem.**

**Uniformity in reproduction of work parts is one of the important advantages of dressing grinding wheels with Tru-Grit rotary diamond-set form dressing wheels. This automotive valve has a groove with one square edge, one beveled, with the end of the stem beveled.**



**Two grinding wheels on a single machine are dressed simultaneously with this two-wheeled Tru-Grit rotary diamond-set form dressing tool. Uniformity of reproduction of a part with widely spaced grooves is assured when both grinding wheels are dressed with a single unit.**

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Here are thread and form grinders that give you toolroom precision plus + production line speed.

Plunge grind threads 1¾" long in a turn and a half

or traverse grind long threads as fine as 60 pitch

And you have a choice of Crushtrue® wheel dressing (or multi-rib or single-rib diamond wheel-dressers) with manual or automatic crushing. Furthermore, Crushtrue dressing is ideal for grinding intricate profiles.

Sheffield's versatile standard Thread and Form Grinders (Model 101, illustrated, capacity 7″ diameter x 12″ long; Model 103, 7″ diameter x 24″ long) are equally at home in the tool room making one of a kind precision threads, or in the production line plunge grinding thousands of threaded or profiled parts.

Wheels may be diamond dressed . . . or Crushtrue® dressed for these advantages:

Greater production: wheel is sharper, grinds cooler. Faster stock removal: no dull flats, no burning, no loading up. Faster redressing: wheel is redressed in seconds. Highly accurate: tolerances on width within .0002″, radii within .002″, straight sides within .003″. RMS finishes as low as 8 microinch, grooves as narrow as .020″.

Standard accessories and special loading, holding, and ejection devices can be made available for specific high production jobs.

May we send you TFG 1159 catalog on models 101 and 103 and Bulletin CR 355 on the remarkable advantages of Crushtrue® grinding?

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Here is the VIZI-DISC mounted on a portable grinder ready to run. Note the unique shape.

As the grinder starts we get a spinning pattern similar to a propeller or electric fan blade.

Operator can "look through" the VIZI-DISC as grinder turns-over at full rpm.

# The VIZI-DISC

PAT. PENDING

This is what everyone is talking about. The new METALITE VIZI-DISC lets you see the exact area where the work is being done. Its unique shape gives it "see through" like a blade of an electric fan or an airplane propeller. This amazing new disc actually cools itself while it's cutting. And, because there is no blind spot, you grind only the area that needs to be smoothed, thus increasing disc life. VIZI-PADS to back-up the VIZI-DISC are available. They have a herringbone non-skid face that grips the abrasive disc, and guarantees an aggressive rate-of-cut. You can get a free demonstration from a Behr-Manning representative or write Dept. GF-5.

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# WHY

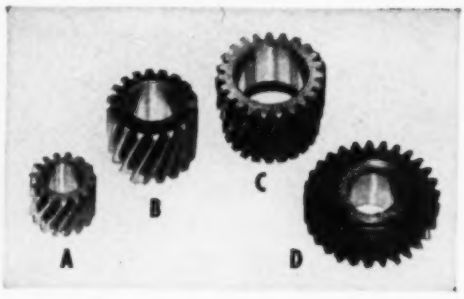
## Microhoning* Transmission Gears Simplifies & Improves Production

Improved product performance and simplified processing – two major factors that are accelerating the swing to Microhoning. Typical of this swing is a major manufacturer of regular and compact automobiles. In the processing of gears for automatic transmissions, this company selected Microhoning for a number of flat surfaces, bores and O.D. of a housing hub—**HERE'S WHY!**

### SIMPLIFIES PROCESSING

Double surface Microflat machines simultaneously Microhone both flat surfaces of pinion and sun gears–first, to obtain proper thickness and parallelism on soft gear blanks. This simplifies subsequent operations (boring, hobbing, chamferring, etc.) by eliminating former orienting of gears to a single finished surface.

The second Microhoning of these flat surfaces, after heat-treating to 59 R "C", quickly removes all burrs and generates final accuracies and surface finish.

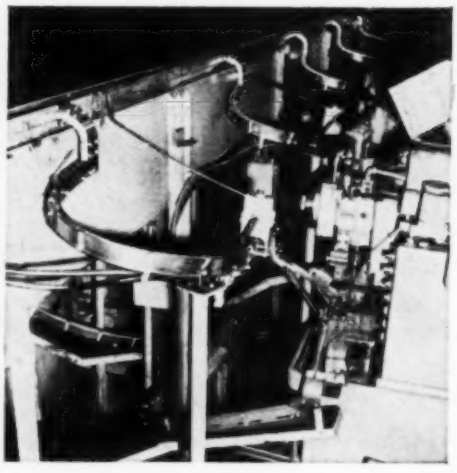



*"A"–pinion gear for large transmission "B", "C" & "D"–pinion and sun gears for compact car transmission*

### EFFICIENT PRODUCTION

After the second flat-Microhoning operation, gears are conveyed to Microhoners for processing the bores. Typical, of the production efficiency realized on all gear bores, is the bore-Microhoning of pinion gears (nine are used in each large transmission).

On eight Microhoners these pinion gears are automatically loaded, positioned, bores Microhoned, checked for size, segregated and ejected (see photo to right). This wholly automatic sequence takes about 18 seconds per gear. Only one set up man is required to keep all eight machines in operation.



An average of .002" stock is removed from each bore; generated surface finish is 10 microinches, rms; roundness and straightness are held within .0001" tolerance; diameter within .0003". Comparable results are obtained on other gear bores (see facing page).

This efficient precision production assures consistent results. Also, reliable precision on component parts is a prime answer to "Why" better performing automatic transmissions are obtained.

**Registered U.S. Pat. Off.*

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

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# FOUNDRY

A joint operating exhibit at the 1960 Casting Congress & Exposition, (Foundry Show) Philadelphia, May 9-13, should be of particular interest to readers of GRINDING and FINISHING.

This is a complete operating foundry presented by Fox Grinders, Inc., of Pittsburgh, Pa.; Baroid Chemicals, Inc., a division of National Lead Co.; Campbell-Hausfeld Co., Harrison, Ohio; and SPO Inc., of Cleveland, Ohio.

### Electro Refractories & Abrasives Corporation

Buffalo, New York **Booth 1229**

**Resinoid Snagging and Reinforced Cut-off Wheels:** Two large photographs 30" wide x 40" long, one showing an action picture of a cutting-off operation and the other a large snagging wheel grinding castings on a floor stand grinder, will be the background for the Electro Refractories & Abrasives exhibit.

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### Master Power Corporation (A Black & Decker Subsidiary)

Bedford, Ohio

**Abrasive Air Tools:** The sander and deburring tool shown below (Model 900) will be a featured part of the Master Power Corporation exhibit. This unit

has been used successfully on irregularly shaped castings for light deburring work.

In addition, a wide variety of light and heavy duty portable air tools will be on display.

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### Pangborn Corporation

Hagerstown, Maryland **Booth 1304**

**Blast Cleaning, Vibratory Finishing and Dust Control Equipment:** Latest model machines will be featured in Pangborn's extensive exhibit.

An impressive array of Rotoblast barrels, the newest vibratory finishing machine in the industry, and several new dust collectors including the "pressure-jet" Type CO will be displayed in a 90′ x 20′ space.

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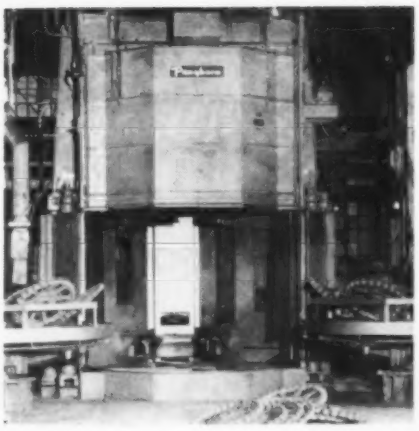
# SHOW



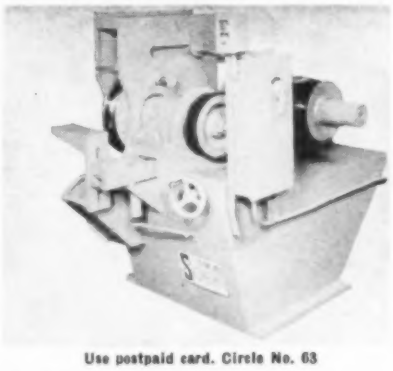
**Pittsburgh Crushed Steel Company**
Pittsburgh, Pennsylvania **Booth 1503**

**Metal Abrasive Products:** An entirely new type of metal abrasive, of an analysis end structure previously unknown to makers and users of metal abrasives, will be announced.

Use postpaid card. Circle No. 62

**The Standard Electrical Tool Co.**
Cincinnati, Ohio **Booth 230**

**Snagging Grinder:** A Type 33VN single end snagging grinder will be in operation in the display. This machine uses a 30" wheel and develops 20 hp.



Use postpaid card. Circle No. 63

**Thor Power Tool Company**
Aurora, Illinois **Booth 1311**

**Air Grinders:** A new line of 6" capacity straight air grinders, featuring a 100% increase in air power and new positive safety controls, will be high-

lighted. Though these new Thor grinders are built to deliver more torque to the wheel and remove more metal faster, they remain in the 10-pound weight class.

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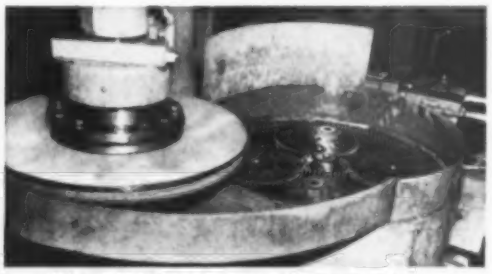
# HOW

# Microhoning* Transmission Gears Simplifies & Improves Production

A major manufacturer of regular and compact cars has selected Microhoning as the most efficient method for securing consistent precision, controlled surface finishes, and simplified processing. Microhoning is used on the flat surfaces and bores of a number of transmission gears plus the O.D. of a housing hub. **HERE'S HOW!**



*Flat-Microhoning small transmission gears—head is swung to left for easy loading.*

*Bore-Microhoning—both spindles fed simultaneously.*

## FLAT-MICROHONING

Both faces of a variety of transmission gears are simultaneously Microhoned. First, soft gear blanks are flat-Microhoned to secure proper thickness and parallelism within .0003", and a finish of 30 microinches (rms) or better. This simplifies subsequent processing by eliminating formerly required orienting of part to only one finished face.

The second flat-Microhoning of faces, after heat-treating to 59 R "C", quickly cleans up all burrs while generating final accuracies and finishes.

## BORE-MICROHONING

The Microhoning of bores for large transmissions is described on facing page. The smaller transmission uses pinion and sun gears having various bore sizes (.697"D. x 3/4"L., .697"D. x 1-3/32"L., 1.030"D. x 7/8"L.).

To generate roundness, straightness, size and surface finish, these bores are processed on double-spindle Microhoners equipped with shuttle-type fixturing. Straightness and roundness are held within a .0003" tolerance, diametric size within .0005". All gear bores are processed in an average 26-second cycle that includes loading, Microhoning and ejection.

## O.D.-MICROHONING

The converter housing hub of the large transmission is also Microhoned. Hub O.D. is 1.936", length is about 2", and it has a blind end with 1/4" relief. Two progressive Microhoning operations remove a total of about .004" stock to generate a surface finish of 15 microinches in a cycle time of 45 seconds per part. Special Microhoning technique generates circumferential lay on hub O.D. to provide compatibility between it and oil seal rotation. *This increases seal life and effectiveness.*

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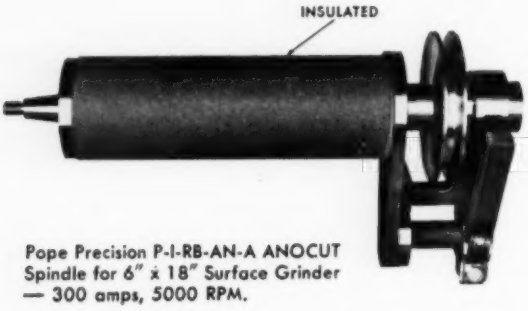
# For Fast Removal Of Tough Metals Specify POPE PRECISION

## ELECTROLYTIC GRINDING ("ANOCUT") SPINDLES

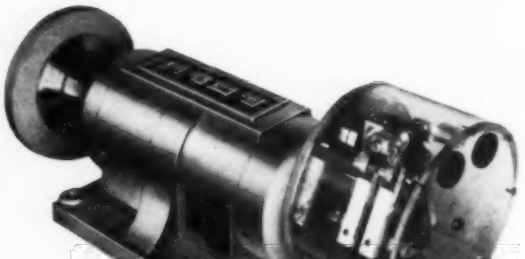
### *with total eccentricity of shaft less than fifty millionths (.000050")*

Pope "Anocut" Spindles are available for 50 to 3000 amp. operation, motorized or belt driven with wheels up to 28" dia. They are equipped with built-in insulation and a *new* Pope rugged fork type, cool operating brush assembly for transmitting low voltage, high amperage current to the wheel.

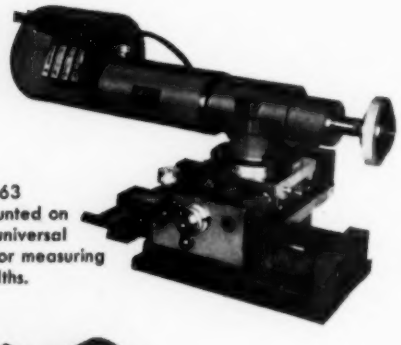
To get the most production out of electrolytic grinding, you need Pope designed, precision built electrolytic grinding spindles. Let us have your specifications for quotations.



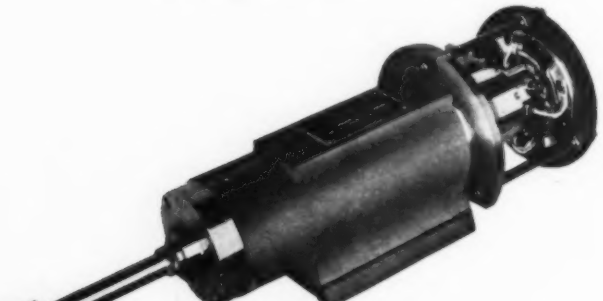

Pope Precision P-I-RB-AN-A ANOCUT Spindle for 6" x 18" Surface Grinder — 300 amps, 5000 RPM.



Pope Precision P-19162 ANOCUT Spindle; 1 to 20 HP, 1800 RPM.

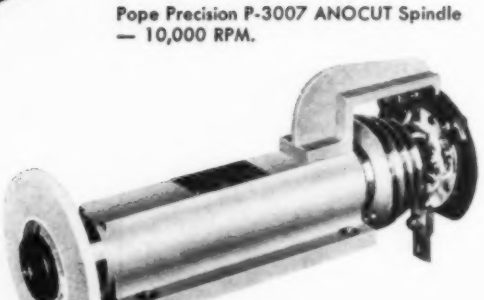


Pope Precision P-19163 ANOCUT Spindle mounted on Pope heavy duty universal slide with indicators for measuring feed in ten-thousandths.



Pope Precision P-3007 ANOCUT Spindle — 10,000 RPM.

Pope Precision P-6651-XG-S4 ANOCUT Tilting Head for attaching to Cincinnati #2 Tool and Cutter Grinder.



Pope Precision P-12001 ANOCUT Spindle — for 2000, 3000 and 5000 RPM.

No. 127

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*Established 1920*

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# Literature

(See Number 1)

(See Number 3)

(See Number 5)

**1. Diamond Grinding Wheels.** A colorful and illustrated four-page catalog bulletin, Form ESA-310, describes the Simonds line of diamond grinding wheels in both natural and man-made diamonds. Contains general recommendations of grain and grade specifications for cemented carbides, an explanatory Simonds diamond wheel marking chart, illustrations of all standard shapes, and operating data to help users get the best use from their wheels. Simonds Abrasive Company, Philadelphia, Pennsylvania.

**2. Form Relieving Fixture; Optical Comparator and Exchange Plan.** Two bulletins describe the R-O universal form relieving fixture and grinder, the R-O comparator, and the exchange plan for adding the comparator to your present R-O equipment. Both sheets are fully illustrated and explain details of the equipment and the exchange program in considerable details. R-O Manufacturing Co., Madison Heights, Michigan.

**3. Annular Form Grinder.** A machine for grinding annular forms and grooves in workpieces up to 10" in diameter and 24" between centers is described in Sheffield's new catalog (No. FG-181-260) on the Model 181 Multiform grinding machine. The machine uses the Crushtrue® grinding wheel dressing process to grind multiple diameters or forms up to four inches wide in one operation with single or multiple wheels. Major features of the machine are described and illustrated, typical applications are shown, and complete specifications are listed. The Sheffield Corporation, Dayton, Ohio.

**4. Small Tool Catalog.** Four-page, two-color folder, brief, descriptive, and fully illustrated, gives all sizes, specifications, uses and prices on six of the Durant small tools. Included are toolmakers' vises and clamps, punch holders, die set pullers, drill vises, and collett holding fixtures. Durant Tool Supply Co., Providence, R.I.

**5. Portable Air Tool Catalog.** A catalog just issued (G-60) is entitled "Metal Finishing with Master Power Air Tools." The Master Power Corporation's complete line of grinders, sanders, and wire brushing tools are described and illustrated. Of particular interest to production and plant management is a special section of suggestions on how to get the maximum output from various types of air tools. Master Power Corporation, Bedford, Ohio.

**6. Air Duct.** A four-page, two-color brochure (Form 622) on the Wiremold line of flexible air duct for air conditioning, industrial ventilating, and materials handling has recently been issued. It includes a selection guide for six types of duct, containing information on where to use each, specifications, and typical installations. Also covered are air duct types for general industrial ventilation, heavy abrasive work, and special types to meet New York City and Chicago air conditioning requirements. The Wiremold Company, Hartford, Connecticut.

**7. New Work Holding Machine.** Bulletin 421, Hammond Machinery Builders, describes a new work holding machine especially designed to hold other than round work pieces for buffing or polishing by regular lathe or abrasive belt machines. The new machine can also be adjusted to hold round parts as large as 14" in diameter. In addition to the Model EPC which is featured, four types and 12 Junior models are listed. Complete specifications are given. Hammond Machinery Builders, Inc., Kalamazoo, Michigan.

**8. Gage Catalog.** The complete line of Standard gages and accessory equipment is described in this 60-page catalog, while price information is given in a supplementary publication. Some of the types included are dial indicators, dial bore gages, dial snap gages, shallow diameter gages, depth and thickness gages, thread gages, both DuBo and conventional plug gages, and various types of fixed gages. The DuBo principle is explained in detail, and suggested applications are given. Standard Gage Company, Inc., Poughkeepsie, New York.

(See Number 8)

**9. Vapor Generator.** Brochure describes the "Coolie-Toolie" vapor generator, which removes heat from tools and machine surfaces in grinding and similar metalworking operations. This low-cost vapor generator is said to keep tools sharper, increase tool life, and permit increased production. This well-illustrated publication includes a complete description and suggested applications, plus information on multi-line units and Coolie

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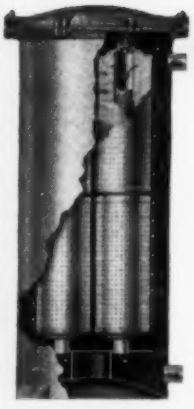
SUPER Filtration ...



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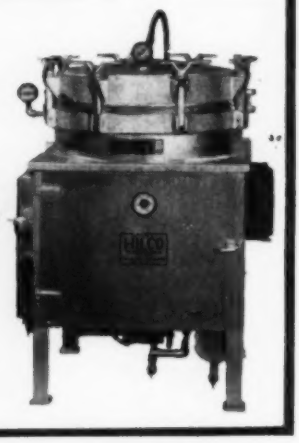

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## FREE LITERATURE continued

coolant concentrates. Associated Technical Sales Company, Dayton, Ohio.

**10. All-Stainless-Steel Filters.** All-stainless filters and filter elements are described in a free bulletin (Release M-213A). Porous stainless steel Surfamax filters designed for maximum filter surface in minimum volume are included. Stock and non-stock filters are listed. Methods of specifying filter area requirements are shown, with special emphasis on flow rates and porosity grades. Micro-Metallic Division, Pall Corporation, Glen Cove, N.Y.

**11. Lapping Compound.** Circular describes the advantages of W.P.10, new lapping compound developed by Scientific Abrasives. The material is said to lap surfaces faster than commercial oil lapping compounds, to prevent the abrasive from caking in the agitator compartment, and to keep parts and machine rust-free and clean. Prices are listed. Scientific Abrasives, Park Ridge, Illinois.

**12. Toolroom Wheels.** The Simonds Abrasive line of SA Borolon wheels is described, wheel shapes for both tool and cutter grinding and for surface grinding are shown, and recommended specifications for various tools and materials are listed. Also included are diamond and green silicon carbide wheels for carbide tools. Ordering instructions are also given. This four-page folder is punched for standard binders. Simonds Abrasive Co., Philadelphia, Pa.

**13. Pumps.** Four-page, two-color folder punched for binding describes the Ruthman Gusher line of molten metal pumps. Various models are illustrated and described. Complete data as to size, materials, maximum temperature of metal and similar information is included. The Ruthman Machinery Co., Cincinnati, Ohio.

**14. Preformed Tumbling Media.** Letter-size mailing piece lists the various forms and types of preformed tumbling media available from Fortune Industries. Color, size, material, and application data are included. Fortune Industries, Inc., Chelsea, Michigan.

**15. Mounting Technique for Wheel Sleeves on Cylindrical Grinding Machines.** Pocket-size 16-page pamphlet contains specific recommendations covering the amount of torque to use in mounting wheels on each of the more common makes of cylindrical grinding machines. The pamphlet was prepared because "springing" of the flange has been found to be the major cause of breakage in sleeve-mounted grinding wheels. Grinding Wheel Institute, Cleveland, Ohio.

**16. Dust Collectors.** Practical ways for solving dust, dirt, and mist collecting problems in the plant are described in a new 16-page catalog (No. DK-820) from Hammond Machinery Builders. General application information is included, along with installation recommendations for polishing and buffing departments and other specific situations. In addition to photographs, cut-away diagrams and floor

plans, the bulletin gives features, dimensions, and specifications on each of the models, accessories and extra equipment. Hammond Machinery Builders, Inc., 1651 Douglas Ave., Kalamazoo, Michigan.

**17. Optical Comparators.** Pocket-size 24-page pamphlet explains in brief text, well-illustrated, the essentials of optical comparators and includes a number of applications to show the range and versatility of the instrument. The piece is entitled, "Jones & Lamson Optical Comparators—What They Are . . . and . . . What They Do." Jones & Lamson Machine Company, Springfield, Vermont.

(See Number 16)

**Portable Tools.** The complete line of Porter-Cable portable tools for production and maintenance use is illustrated and detailed in this thirty-six page catalog. Included in the line are saws, sander-polishers, belt sanders, drills and bench grinders, together with a wide variety of accessories and other equipment of related nature. Porter-Cable Machine Co., Syracuse 1, New York. (Catalog No. 108, 25 cents).

## CURRENT FILMS

### "AUTOMATIC DRILL POINT GRINDER"

A ten-minute 16mm color sound film shows the Model 100 Winslow-matic drill point grinder in operation, producing various types of drill points with a sharpening capacity from 1/32" through 1.50". The machine produces ultra-precision points at a very high production rate. Write Winslow Product Engineering Corporation, 47 St. Joseph Street, Arcadia, California.

### "DIMENSIONAL AIR GAGING"

The fundamental principles of measuring dimensions with air pressure and how these principles are used to obtain a high degree of gaging accuracy and reliability is described in a 16MM sound color film produced by Federal Products Corporation of Providence, Rhode Island.

Titled "DIMENSIONAL GAGING WITH AIR", the film shows actual tests to illustrate basic principles of air gaging while demonstrations show the practical applications and possibilities. Other scenes show how air gages are used in general machine shop gaging, and how they are applied to high-production multiple inspection, and in various types of machine control applications.

"DIMENSIONAL GAGING WITH AIR" is available on a free loan basis through the Sales Promotion & Advertising Department, Federal Products Corporation, 1144 Eddy Street, Providence 1, Rhode Island, (running time—42 minutes, 16MM —sound and color). Films must be returned Prepaid **EXPRESS.** • • •


## DYNAMIC POLISHING and DEBURRING

The GRIND-O-FLEX saves valuable production time in polishing and deburring rounded, contoured and flat surfaces. A flexible abrasive wheel that features **slashed** construction, type BL GRIND-O-FLEX practically envelopes the part with dynamic, moving abrasive.

Easy to use, economical, the GRIND-O-FLEX consists of a rugged hub that holds a number of simple-to-replace abrasive pads. No special tools are required to load the hub.

The pads, available in a variety of grits, wear evenly, exposing a continuously fresh abrasive surface.

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Precision Parts Ground
20 TIMES FASTER
when put on the No. 18 Blanchard

"408 precision washers, in one chuck load, now surface ground in same time as 20 by former method . . . substantial savings on all other Blanchard-ground jobs . . . finished work quality outstanding . . . former sub-contracted jobs now done at less cost in our own shop . . . operator fatigue practically eliminated . . . maintenance is very low."

Are you missing opportunities like these by not using Blanchards on your surface grinding jobs? Write for your copy of "Work Done on the Blanchard"

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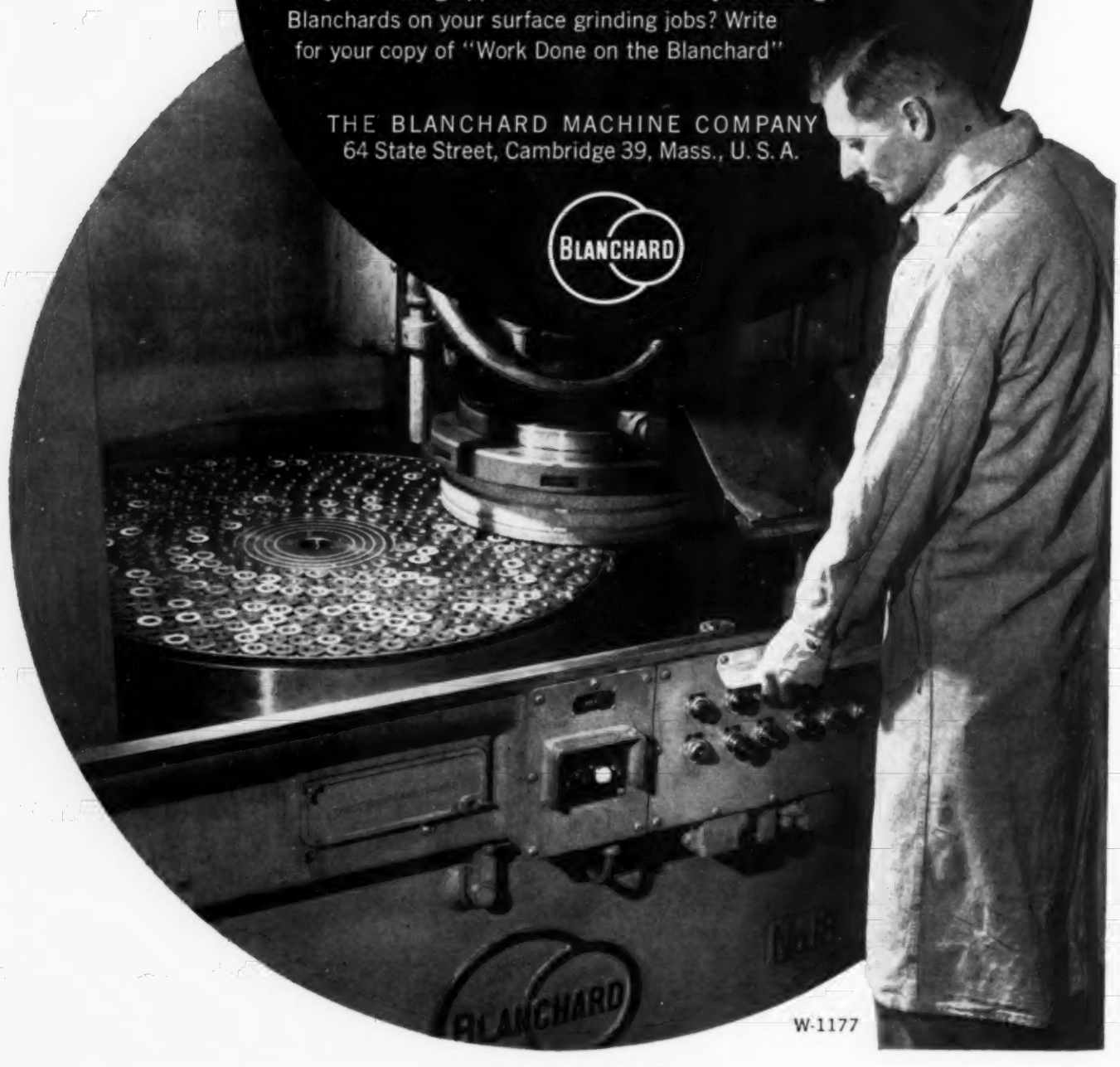


W-1177

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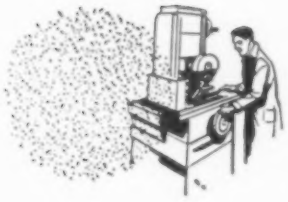
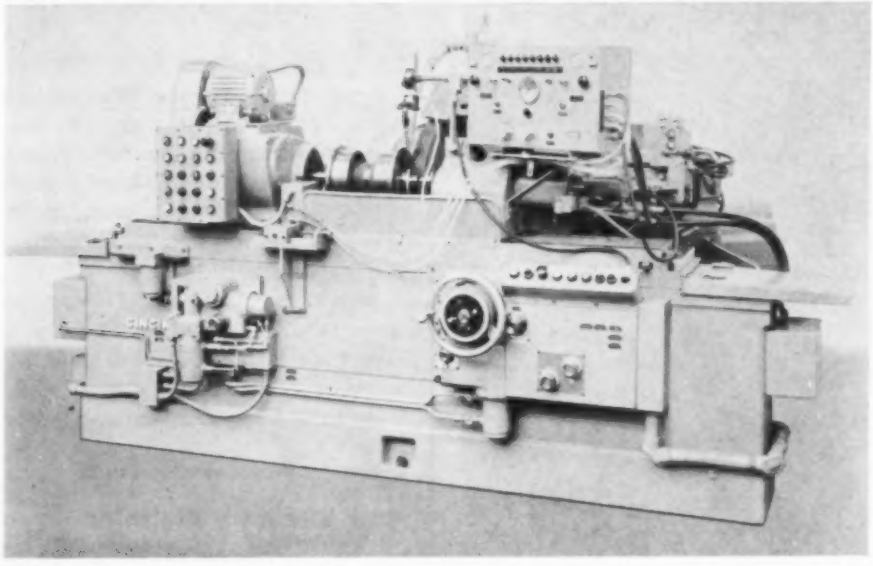


# Equipment and Materials

### Angular Wheel Slide Grinder



Shoulders and shafts ground simultaneously, with critical dimensions, angles, and corner radii established at the same time—this is the work cut out for one line of grinding machines built by Cincinnati Milling's Grinding Machine Division.

The new Cincinnati Filmatic semi-automatic angular wheel slide grinding machines, built in 6"R & 10"L and 10"R & 14"L sizes, are specifically designed to combine O.D. and shoulder grinding in a single, fast, automatic cycle. Typical applications include crankshafts, steering knuckles, gear blanks with hubs, and stepped shafts with critical flanges, tapers, and shoulders. Built to feed at either 30° or 45°, these machines make it easy to obtain a superior circular line finish instead of a criss-cross finish.

Generally, work pieces having a long ground diameter compared to shoulder height are better suited to a 30° machine while jobs having shoulder height equalling or exceeding the diameter are better adapted to 45° wheel feed machines.

Automatic behind-the-wheel profile truing provides fast, accurate grinding wheel truing with provisions for two to ten passes with or without diamond advance on the last pass. It may be set to true after a predetermined number of pieces has been ground.

Automatic grinding wheel balancing is also standard on these machines. It provides a method to balance the wheel on the machine in seconds.

Sizing adjustments as fine as .00005" on work diameter are possible because of Cincinnati's hydraulic motor drive of the infeed screw. The all V-Belt headstock drive assures smooth work rotation for high quality finishes.

As optional equipment the Cincinnati angular wheel slide grinder can be provided with automatic air-electric gage sizing with a cycle time stabilizer which automatically corrects the grinding time cycle to compensate for wheel wear. An automatic gap eliminator is offered to reduce time "cutting air" during infeed grinding cycle, and a simple, accurate flagging device, either manual or automatic, is available for axial location of work.

The Cincinnati Milling Machine Co., Grinding Machine Division, Cincinnati, Ohio.

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### Class XXXX Setting Masters Announced

Class XXXX Master Setting Rings and Disks manufactured to tolerances as fine as five millionths of an inch are available from The Sheffield Corporation. They are made in both A.G.D. and Sheffield Precisionaire® master ring and disk styles.

Class XXXX rings and disks within size range .125" to .825" are calibrated and certified to accuracy of .0000025 by the company's Eli Whitney Metrology Labroatory while sizes .825" to 1.000" are calibrated and certified to an accuracy of .0000035. The rings are also inspected for circularity, taper and bellmouth. Dimensional size as well as deviation from circularity are recorded on the certificate of inspection accompanying each ring.

Other sizes can be supplied on special order.

The Sheffield Corporation, Dayton, Ohio.

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## ACTION DIAMOND WHEELS

HONES – MOUNTED POINTS

1 YOU TELL Action Diamond what you want your diamond wheel to do.
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3 YOU GET precisely the right diamond wheel in shape, grit and bond to assure the accurate, low cost production that only a custom-built Action Diamond wheel can deliver.
JETALINE DIAMOND WHEEL
RoBot Resin DIAMOND WHEEL

## *Custom Built for the Job at No Extra Cost*

Your custom built Action Diamond wheel has the same price tag as any diamond wheel of comparable specifications. The extra production per wheel delivered is all profit for you. Call Action in, by letter or 'phone. Show us your grinding problem. You are guaranteed an expert analysis of your diamond wheel requirements at no cost, no obligation.

**At ACTION . . . The Right Wheel For Your Material**

| | |
|---|---|
| ROBOT RESIN DIAMOND WHEELS | • for wet or dry grinding. |
| JETALINE DIAMOND WHEELS | • for conventional wet grinding.<br>• for electrolytic grinding. |
| JETALINE METAL BONDED ABRASIVE WHEELS | • for electrolytic grinding. |

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**ACTION DIAMOND TOOL CO.**

*The Pioneer of The Modern Diamond Wheel*

4545 WEST GRAND AVENUE, CHICAGO 39, ILLINOIS

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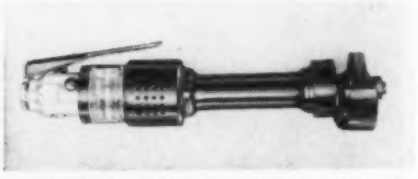
### Small Horizontal Grinder

Smallest of a family of general purpose horizontal grinders—only 10" long and weighing 40 ounces—are the 31G-520 (illustrated) and 31G-720 grinders just introduced by Buckeye Tools Corporation.



Principal application of these air tools is die grinding, but they are well-suited for deep hole grinding.

Design features are: all-steel housing, shielded bearings to improve grease retention, and rotatable baffle ring and muffler to reduce noise.

Both tools operate at 20,000 rpm, require ¼" ID hose and 90-100 psi pressure, have 1-5/16" OD front heads, and accept a maximum 1¾" organic wheel.

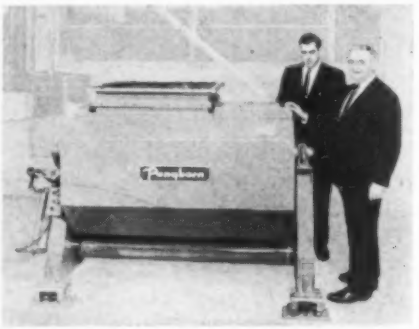
Buckeye Tools Corporation, Dayton, Ohio.

Use postpaid card. Circle No. 20

### New Vibratory Finishing Equipment

A complete line of vibratory finishing equipment, representing twelve years of experimentation and refinement, centers about an air-cushioned vibratory finishing machine, distinguished by a suspension system long used successfully on busses and trucks.

Designed to replace and extend the application of tumbling and precision



barrel finishing, the new machine embodies simple, rugged and compact design features.

The new Pangborn machines are said to turn out work up to 100 times faster and at much lower cost than present tumbling and precision finishing barrels. This is possible because every

# Grinding and Finishing

**MAY, 1960**

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**EDITORIAL**

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**EDITORIAL**

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VULCANITE CENTERLESS WORK AND REGULATING WHEELS

# PRECISION MATES!

Centerless grinding is the highest in the art of metal finishing. Unless the work wheel and the regulating wheel have been made for each other, a *needless* handicap occurs. U.S. Rubber centerless wheels are precision-mated. The production of perfect mates for centerless grinding is a U.S. Rubber specialty.

"U.S." Vulcanite was the first rubber-bonded wheel made for industrial America. 100 years of production and research back up our present *precision mates*. The hundreds of plants that use "U.S." Vulcanite *precision-mated* wheels prove the point that to do otherwise imposes a needless handicap.

The "U.S." Grinding Wheel sales engineer will save dollars for you in your grinding operations. We will welcome a call from you at U.S. Rubber, Grinding Wheel Dept., 10 Eagle Street, Providence, R. I., or the address below.

Mechanical Goods Division

**United States Rubber**

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

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cubic inch of the vibrating load is in constant work motion, where in tumbling barrels the action is imparted only to the relatively small portion of the load which happens to be sliding at a given instant.

The air-cushioned vibratory finishing machines come in 1½, 3, 6, 12 and 18 cubic feet sizes, with larger models soon available.

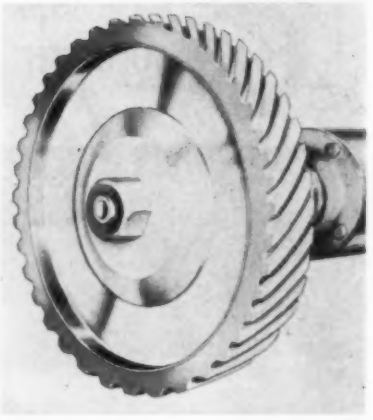
Pangborn Corporation, Hagerstown, Maryland.

Use postpaid card. Circle No. 21

### Molded Rubber Contact Wheel

The new Cosmo R-100 molded rubber contact wheel is used for grinding and polishing with coated abrasive belts and bands.

Prime features of the wheel include rubber molding between the two steel discs that form the wheel sides. All wheel arbor holes are standard, but the aluminum or steel flanges inserted into the wheel arbor holes are machined to the diameters required.



The R-100 is completely balanced for smoother running, is available in durometer ranges from 10 to 90, has oil resistant tires with plain or serrated faces, and can be used for wet or dry operations.

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### Reinforced Cup Grinding Wheel

Bullard has recently brought out a resin-treated fibre glass reinforced cup wheel, 6/5½ x 1¼ x 5/8-11, which is lighter than a conventional 6/4-3/4 x 2 cup wheel, and is claimed to be both safer and more productive.

Four layers of fibre glass, molded internally, are strategically located to increase safety in operation.

Because the 5/8-11 nut is assembled externally, the wheel is said to provide more usable abrasive than conventional cup wheels.

Offered in only one size, the wheels are color-coded by application. Gold wheels are for medium hard to hard ferrous metals; black, for medium soft to soft ferrous metals. Red are for hard non-ferrous metals; blue for soft. Green wheels are intended for hard non-metallics, and silver, for soft, as well as for copper, bronze and pig iron.

Geo. H. Bullard Co., Inc., Westboro, Massachusetts.

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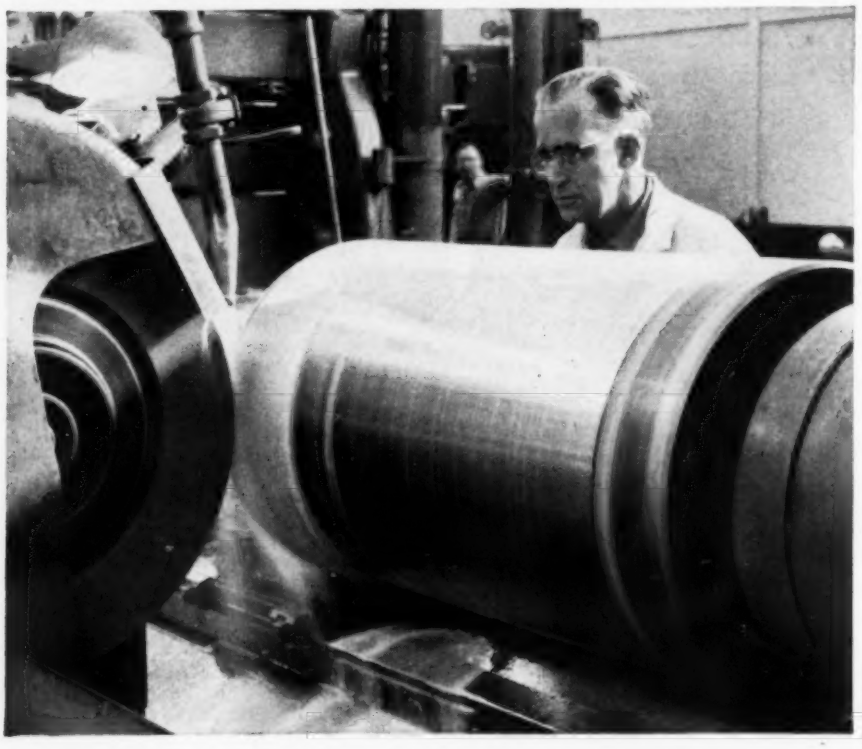
*Where the wheel meets the steel . .*



## "Jobs change—but coolant doesn't with W&B E-55 in this Norton Grinder!"

"We can never tell what tough job is coming up next in this cylindrical grinder," says Mr. Ellis E. Carlson, Jr., General Foreman of Norton Company's Central Service Department. "It may be stainless (like the job shown here) or any number of non-ferrous metals, alloys or steels.

"We do know that, no matter what the metal, W&B Grinding Coolant E-55 will do the job! It gives us good cooling; keeps the wheel clean and free cutting. And we don't have to clean the tank as often.

"On top of that, E-55 doesn't foam; settles chips fast; and gives good rust protection. It makes a clean, transparent coolant that doesn't smell bad and is easy on the hands." What more could you ask?

**Send for a FREE working sample** of W&B E-55! Write coolant tank size, plus make and type of grinder and typical jobs . . . on company letterhead. Mail to The White & Bagley Co., 88 Foster Street, Worcester, Mass.

W&B INDUSTRIAL LUBRICANTS

**THE WHITE & BAGLEY CO.**

Worcester, Massachusetts • Detroit, Michigan

*Originators of Grinding Lubricants*

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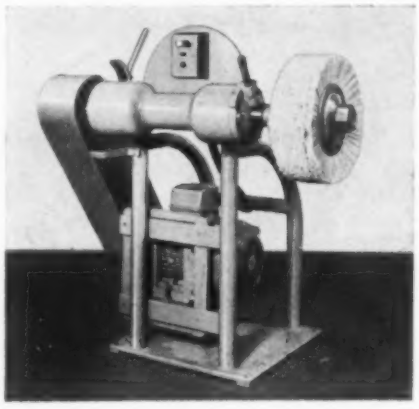
### Low-Cost Lathe for Buffing, Polishing, Deburring, Brushing

A new lathe, incorporating all the advantages of top-performance lathes, but stripped of all unnecessary "frills" to keep costs to a minimum, is now being produced by Murray-Way Corporation, Birmingham, Michigan.

Practically the entire cost is allocated to a top-quality spindle assembly which is mounted on a simple, sturdy struc-



tural base. Labyrinth seals prevent dirt from entering the housing in which the spindle runs.

Lathe capacity is from 10 to 20 hp. The spindle is driven by easily-changed multi-V-belt sheaves, which may be changed to vary speeds.

Murray-Way Corporation, Birmingham, Michigan.

Use postpaid card. Circle No. 24

### Automatic Screen Separator

Fast, accurate separation of processed parts and tumbling media over a broad work range is claimed for Model SS-4L screen separator machine. Variable speed drive permits adjustment from 145 to 350 reciprocations per minute, with screen movement variable from 0" to 1½". The machine is completely

self-contained, motor driven, with 3° to 7° adjustable slide angle. Interchangeable square mesh screens are used. Size of the Model SS-4L is: 10½' long x 43" wide; height to top of cradle is 44".

Rampe Mfg. Co., Cleveland, Ohio.

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OSBORN®

**BEFORE BRUSHING**
Insulation residue on this small, copper electric motor commutator was a knotty, costly cleaning problem. Rate: 800 per hour.

**AFTER BRUSHING**
Surface quality-finished . . . insulating material and feather burrs gone . . . ready for trouble-free assembly. Rate: 3500 per hour.

# Production soars from 800 to 3500 pieces per hour

## ...with OSBORN power brushing

**PRODUCING** at the rate of 3500 pieces per hour (over 330% greater than former off-hand method) these Osborn TY® Master® Wheels remove troublesome phenolic-type residue from electric motor commutators at Dayton Precision Manufacturing Co.

Slow, off-hand methods were being used to remove insulation residue from these commutators. Production was costly . . . parts lacked uniformity.

A specialized, but simple machine now handles the operation. Parts are automatically fed along a guide tube and through a pair of Osborn TY® Master® Wheel brushes. In this centerless type finishing setup—the job is done effectively in pre-set time cycles. Results: production and quality up—rejects eliminated . . . time and costs down.

Cleaning and finishing problems in your plant can be solved with similar production savings. An **O**sborn **B**rushing **A**nalysis—made in your plant now at no cost or obligation—is the first step. Write us for full details. *The Osborn Manufacturing Company, Dept. G-4, Cleveland 14, Ohio.*

Osborn Brushes

METAL FINISHING MACHINES . . . AND FINISHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

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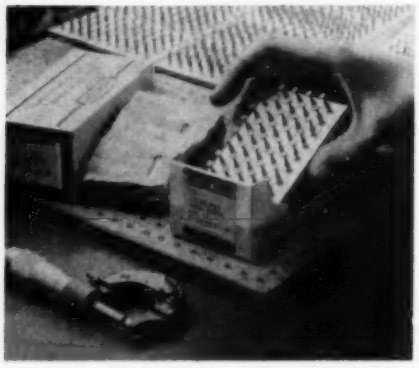
NEW EQUIPMENT *continued*

### Miniature Precision Mounted Grinding Wheels

A new line of miniature precision mounted grinding wheels has been developed and is commercially available from Norton Company.

These abrasive wheels, made as small as .036" diameter and as thin as .016" were developed for use in miniature precision bearing manufacture. Additional applications for these miniature wheels are being found in the tool and die industry, specifically on jig grinders.

Because of the extremely small diameters, these wheels must rotate at extremely high speeds to insure proper



grinding action. Even at 100,000 to 150,000 revolutions per minute of the ultra high speed spindles on the machines using these wheels the surface feet per minute of the wheel sometimes gets as low as 1000. Normal grinding speed for conventional grinding is about 6500 sfpm.

Grinding ratios of volume stock removal as high as 100 to 1 have been reported on 60 Rc hardened bearing steels. Typical specifications of these small wheels are A320-TVM for bore grinding and A320-MVG, No. 22 treated, for ball race grinding.

Norton Company, Worcester, Mass.

Use postpaid card. Circle No. 26

### Heavy-Duty Dresser

A new heavy duty No. 22 Dresser has 2⅜" diameter cutters and a 2" cutting face.

It features an improved six-set bearing assembly which furnishes six bearing holes, eliminating wear on the

exclusive "pistol-grip" handle. The bearing blocks are easily indexed to present new bearing surfaces. Their hardened edges protruding from the dresser head prevent the grinding wheel from hitting the handle casting, and grinding away the bearing surfaces.

The new No. 22 Dresser is suitable for all dressing on medium and large wheels, and is particularly well-suited for wide faced wheels.

Machine Products Corp., Dayton, Ohio.

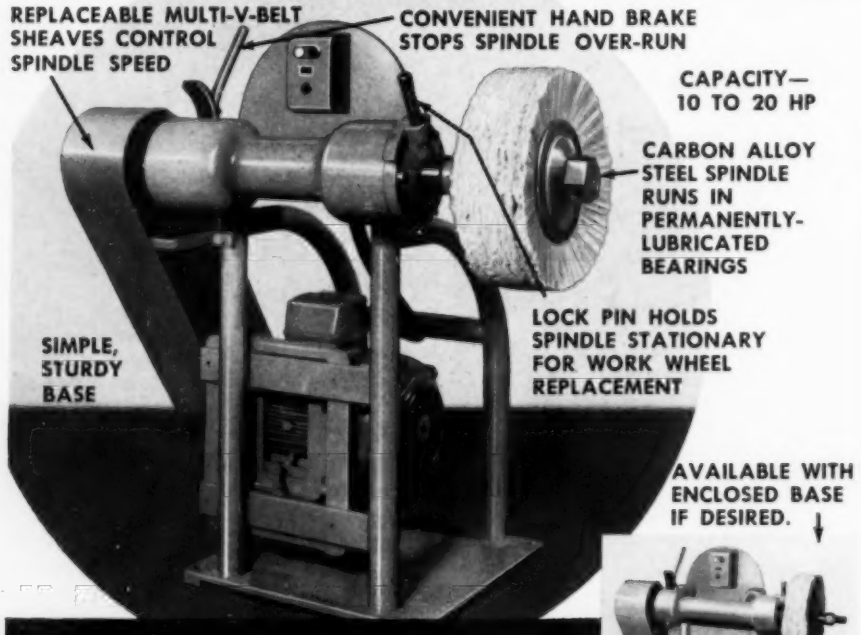
Use postpaid card. Circle No. 27

### Conversion Equipment for Electrically-Aided Grinding

The Standard Electrical Tool Company, Cincinnati, Ohio, have expanded their program on spindles for electrically-aided metal removal with a variety of conversion equipment for basic machines, as illustrated.

The photo shows some of the available equipment: (1) mounting bracket removed from an older model Brown & Sharpe OD grinder, assembled with a super-precision spindle and slip-ring for 300 amp power supply; (2) super precision spindle with slip-ring for 150 amp power supply, interchangeable with existing spindle on a Cincinnati No. 2 tool and cutter grinder; (3) amp, 25,000 rpm grinding attachment with


**LOW COST, Buffing, Polishing, Deburring**


REPLACEABLE MULTI-V-BELT SHEAVES CONTROL SPINDLE SPEED
CONVENIENT HAND BRAKE STOPS SPINDLE OVER-RUN
CAPACITY— 10 TO 20 HP
CARBON ALLOY STEEL SPINDLE RUNS IN PERMANENTLY-LUBRICATED BEARINGS
LOCK PIN HOLDS SPINDLE STATIONARY FOR WORK WHEEL REPLACEMENT
SIMPLE, STURDY BASE
AVAILABLE WITH ENCLOSED BASE IF DESIRED.

**Murray-Way's NEW ECONOMY LATHE!**

This new lathe has all the essential features of an expensive, top performance lathe at only a fraction of the cost. All unnecessary "frills" and usual inside base adjustments have been eliminated, leaving a top quality spindle mounted on a simple, sturdy, stanchion type base.

Husky, permanently-lubricated bearings on wide centers assure maximum service life and ample work pressure support. Width between wheel flanges is 6", greater widths available if desired. Arbor sizes 1½" to 2". Floor area 43"x 34".

*Write for illustrated literature and prices.*

MURRAY WAY

MURRAY-WAY CORPORATION
P. O. BOX 180 • MAPLE RD. EAST
BIRMINGHAM, MICH.

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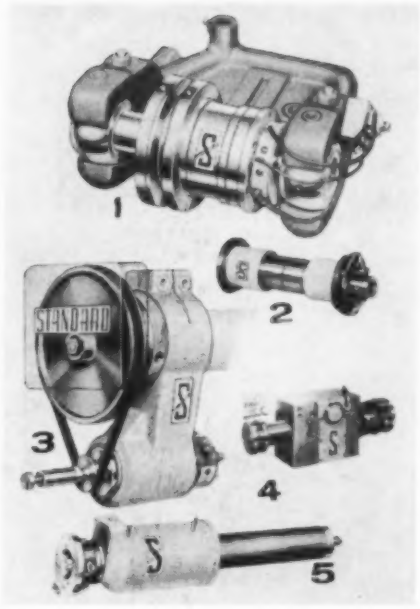


interchangeable quills for assembly on the spindle nose housing of a conventional surface grinder; (4) assembly for No. 08 milling machine; (5) 300 amp motorized spindle for any surface grinder.

The Standard Electrical Tool Company, 2486 River Road, Cincinnati 4, Ohio.

Use postpaid card. Circle No. 28

### Electrical Gages Speed Inspection

Electric limit contacts built into an ordinary mechanical comparator gage act with finer discrimination than ordinary dial indicators, detect offsize conditions accurately and instantly.

The electric comparator gage is also faster, since the eye perceives the lighted signal lamps more quickly. Low initial costs, plus minimum installation and maintenance costs are additional advantages of the Mauser line of electrical gages.

Scherr-Tumico Co., New York, N.Y.

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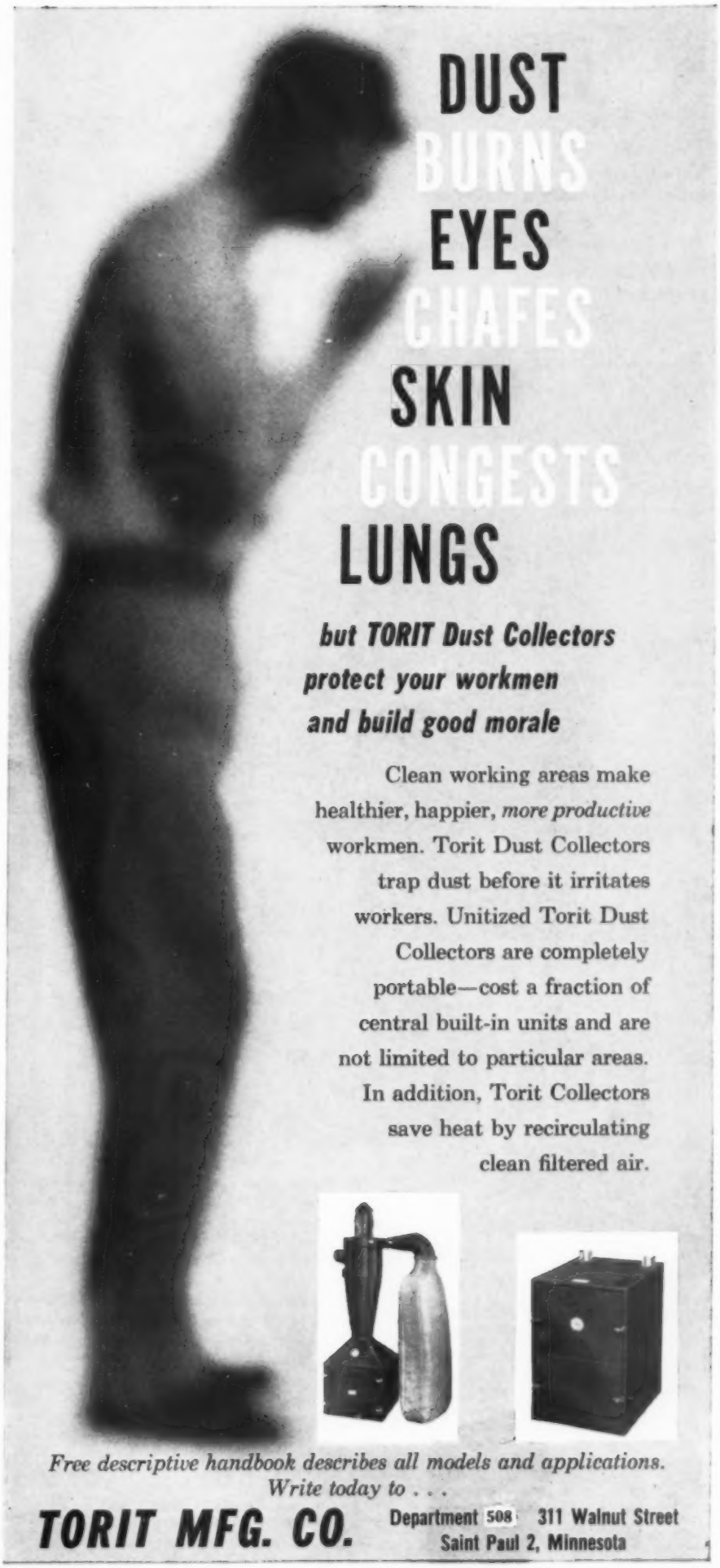
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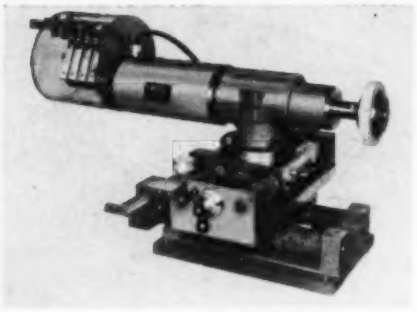
### Spindle for Electrically-Aided Grinding

This new Pope Spindle (P-19163-AN) for electrically-aided grinding is equipped to operate at 1000 amperes. It employs a 2 HP, 3600 RPM motor. The Spindle is mounted on a Pope heavy duty universal slide. Attached to the slide are large dial indicators for measuring feed of the work in ten-thousandths of an inch.

This spindle is representative of a wide range of Pope Precision Spindles arranged for electrically-aided grinding. These spindles are motorized or belt driven, to run with wheels up to 28" dia., and are available to operate from 50 to 3000 amps., at speeds up to 10,000 RPM. Total eccentricity of the Pope precision spindle shafts is less than fifty millionths (.000050").



Pope Machinery Corporation, Haverhill, Mass.

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### New Line of Automation Tools

A new 21K and 21L Series of automation tools, combining the efficiency and economy of air motors and air cylinders, has been introduced for use in drilling, tapping, fastening, grinding, reaming, counterboring, and wire brushing.

Where most Buckeye tools produce rotary motion only, the 21K and 21L series also produce linear motion, moving from its fixed retracted position to the precise work spot. Length of the stroke can be adjusted to micrometer accuracy over the 0" to 2" range by rotating the graduated external sleeve, then locking it in place. Tools may be operated singly or in groups following any desired sequence with controls matched to the desired degree of automation.

The two series differ only in the construction of the feed cylinder. The 21K Series is retracted by a spring return system, while the 21L is retracted by a double-acting air cylinder to preserve higher feed and/or retraction forces.

Buckeye Tools Corp., Dayton, Ohio.

Use postpaid card. Circle No. 31

### High-Speed, Low-Vibration Pneumatic Grinder

A new high-speed, low vibration pneumatic grinder with a special spindle extension for improved visibility of work area and for better control with two-handed operation has recently been announced.

This new Dotco Model 1EL3 grinder features a cool, four-vane rotary air motor with a speed of 28,000 rpm and close manufacturing tolerances with spindle accuracy of .0005 maximum run-out on all collet-type grinders. Use of Erickson 300 series collets as standard equipment also helps achieve

NEW

Hammond

CAMMED JUNIOR AUTOMATIC

*Work Holding Machine*

The new Hammond Cammed Junior Automatic (Model EPC) is especially designed to hold other than round work pieces while being polished or buffed by a regular polishing and buffing lathe or abrasive belt machine. In addition, it will hold round parts as large as 14" in diameter.

Hammond OF KALAMAZOO Good Machinery Since 83

The Hammond Junior Model EPC is automatically cycled. When variable work dwell timer is started by pushbutton, the work spindle starts and the cam and work are moved into contact with the cam follower and wheel through the pressure weights with speed of movement being controlled by an air cylinder.

The pre-set timer permits work to dwell at finishing wheel for required periods up to one minute, when work is automatically air retracted to load-unload position and work spindle stopped. Weight can be varied to suit correct finishing pressure.

Cams are designed to suit each work piece and finish requirement. The standard adjustable 14" dia. cam follower disc is bracket mounted on the machine and is set on center with the wheel spindle.

Hammond Machinery Builders Inc.

1651 Douglas Ave. Kalamazoo, Michigan

Use postpaid card. Circle No. 246

extremely low vibration that prolongs cutting tool life and produces faster, smoother metal removal and finishing, and use of tools having shanks from 3/64" to 1/4".

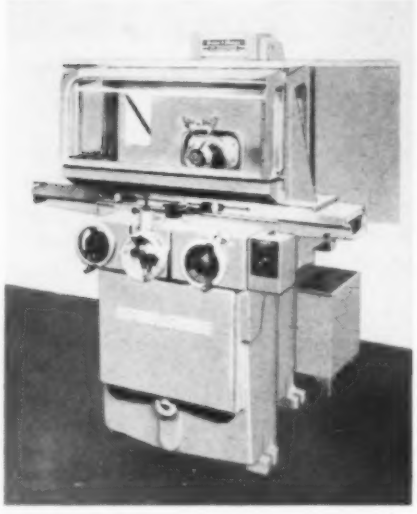
In addition to positive starting, Dotco's rotary air motor design is claimed by the manufacturer to deliver higher torque and horsepower output in a more compact, lighter weight unit than turbine-type or electrically-driven tools.

Doeden Tool Corporation, Sherwood, Ohio.

Use postpaid card. Circle No. 32

### Slicing and Dicing Machine

A new 618 Micromaster® slicing and dicing machine automaticaly wafers semi-conductor materials such as germanium, silicon, quartz crystals, etc. with parallel accuracy to one ten-thousandth of an inch and consistently repeats in size to plus or minus two ten-thousandths.



Utilizing a metal-bonded or resinoid-bonded diamond wheel, this easy-set-up machine produces clean, "burn-free" wafers. Table driving mechanism provides smooth feed, infinitely adjustable from 0.100" to 144" per minute with rapid table positioning adjustable to approximately 25 feet per minute.

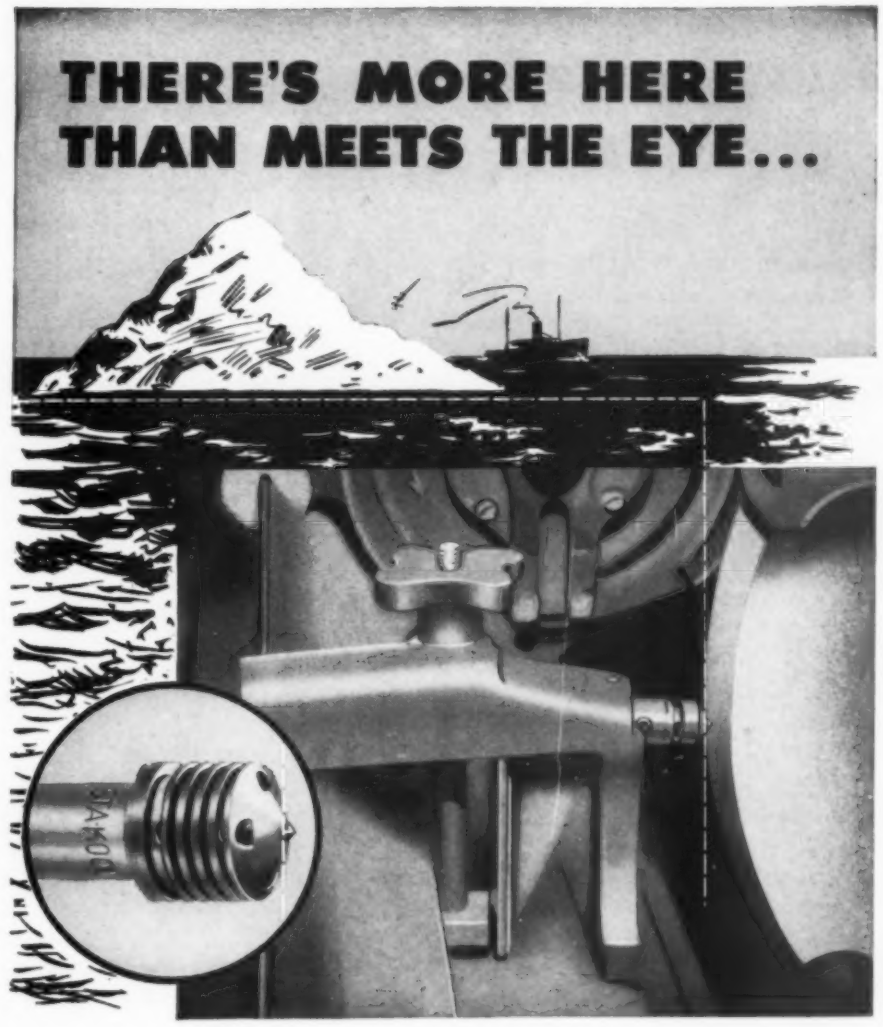
Brown & Sharpe Mfg. Co., Providence, Rhode Island.

Use postpaid card. Circle No. 33

### Air-Flow Flinger Keeps Coolant From Spindle Bearings

A new concealed axial air flow flinger is proving successful in preventing coolant from entering spindle bearings. It also provides complete protection for the operator from the hazard of exposed high-speed rotating end covers.

The new flinger is now incorporated in Pope internal grinding spindles.


In an iceberg or in a J. K. Smit Diamond Tool only a fraction shows above the surface.

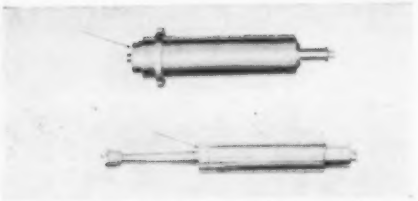
Everyone knows about the unseen portion of an arctic iceberg. Many do not realize the unseen factors that lie beneath the surface of a J. K. Smit Diamond Tool, such as . . . our constant research to find still better methods of manufacturing Diamond Tools, the unquestioned integrity of our company since 1888, the manufacturing skills that have been learned and passed on through all those years, and quality control of manufacture for tool duplication.

All these hidden assets count much toward maintaining our position as a leader in the industry today.

When *your* next job specifies a diamond tool for any purpose contact J. K. Smit. Our field representatives are trained and qualified to assist you with any standard or special application.

J. K. SMIT & SONS, INC.
HOME OFFICE AND PLANT
MURRAY HILL NEW JERSEY

Use postpaid card. Circle No. 247



These precision spindles are built so that the total eccentricity of the shaft, measuring in the tapered hole, will not exceed twenty millionths (.000020). They are dynamically balanced with all rotating parts in full assembly to twenty-five millionths (.000025) amplitude of vibration.

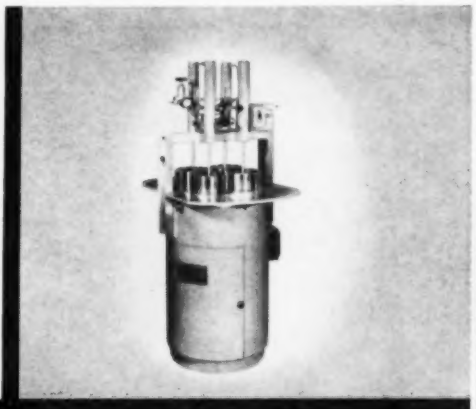
Pope Machinery Corporation, Haverhill, Massachusetts.

Use postpaid card. Circle No. 34


**THE 18" SPEEDLAP**

Exceptionally well suited for smaller parts (1/16" to 6¾" O.D.) such as silicon semi-conductors, valve discs, spacer washers and hearing aid components including parts as thin as .003". Has 143 square inches of working area available with capability of removing 1.43 cubic inches of material* per hour.

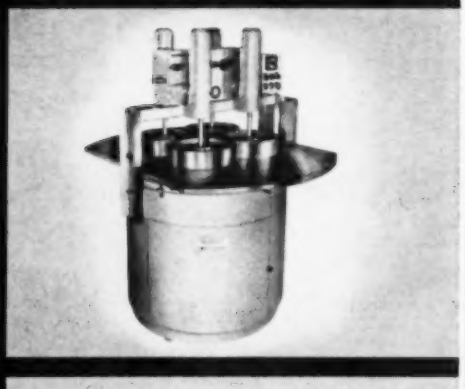
* FREE MACHINING METAL



**THE 32" SPEEDLAP**

Excellent for handling intermediate size parts (½" to 12" O.D.) like compressor plates, pump rings, die castings and seal plates; also parts to .010" minimum thickness. Provides 450 square inches of useable working area with a stock* removal rate of 6.75 cubic inches per hour.

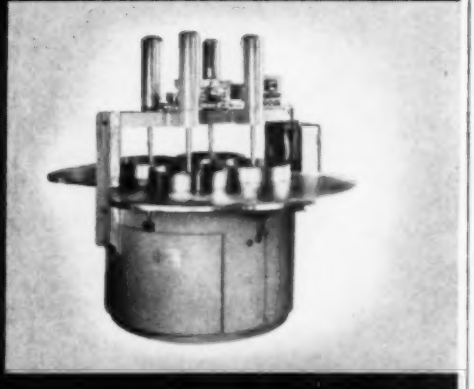
* FREE MACHINING METAL



**THE 48" SPEEDLAP**

Accommodates large parts (½" to 18" O.D.) or an extremely high volume of small parts. Applications include pump housings, small cylinder heads, valve plates, meat chopper discs, etc., and myriad small parts in quantity. Working area covers 1050 square inches. Unit is capable of removing 26.25 cubic inches of material* per hour.

* FREE MACHINING METAL



**SPEEDLAP**

removes stock faster than most grinders—accurate to within millionths of an inch. Materials range from the ceramics and silicons through the steels (including stainless) as well as castings and die castings . . . Larger size machines on special order.

Ask for free cost and production estimates based on samples or prints of your parts. Job lapping service also available.

*PHONE ORchard 6-1500 or write:*
**SPEEDLAP CORPORATION**
8022 N. Monticello Avenue
Skokie, Illinois

Use postpaid card. Circle No. 248


## New Surface Plates Have Two Working Surfaces

Reversible black granite surface plates that extend plate life and usefulness while effecting multiple economies are the latest innovation in precision measurement to be announced by The DoALL Company. They cost only one-third more than single-faced plates.

The new, reversible plates are available in all standard sizes from 8 in. x 12 in. to 48 in. x 144 in. The two surfaces may have the same finish or a combination of any two standard grades, AA (laboratory), A (inspection) or B (shop). All grades meet government specification GGG-P-463. Each surface is permanently identified.

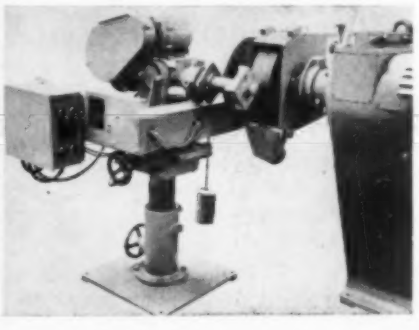
Removable trunnions make it easy to turn the plates. The trunnions consist of standard bolts, found in any shop, screwed into two threaded inserts permanently imbedded in the black granite.

The DoALL Company, Des Plaines, Illinois.

Use postpaid card. Circle No. 35

## Work Holding Machine for Buffing, Polishing

A new work holding machine, the Hammond cammed junior automatic (Model EPC), is especially designed to hold other than round work pieces for buffing or polishing by regular lathe or abrasive belt machines. The machine



is also easily adjusted to hold round parts as large as 14" in diameter.

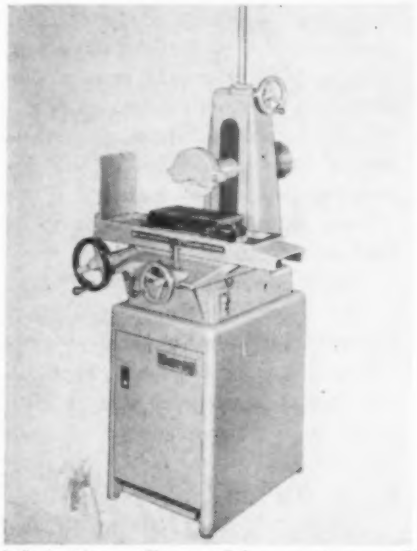
In addition to the Model EPC, there are four types and twelve junior models to choose from.

Hammond Machinery Builders, Inc. Kalamazoo, Michigan.

Use postpaid card. Circle No. 36

### Compact, Low-Cost Precision Surface Grinder

A new compact surface grinder, the Harig 612, is said to represent a breakthrough in design and construction to offer industry a low-cost precision machine featuring automatic forced



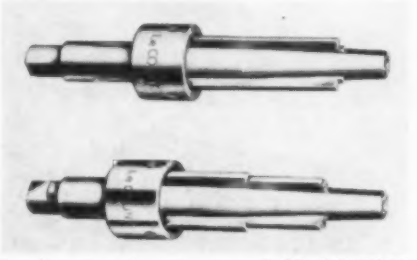
lubrication, direct drive motor and choice of right- or left-hand longitudinal feeds as standard equipment. These features, usually found only on more expensive models, simplify grinder operation and maintenance.

Harig Mfg. Corp., Chicago, Ill.

Use postpaid card. Circle No. 37

### .0001" T.I.R. Guaranteed Expanding Mandrels

Latest additions to the LeCount Tool Works are two models of expanding mandrels, guaranteed precise to .0001" T. I. R. These new "Micro-Centra" mandrels are identified as Model MCA



in the step-jaw type and Model BMC in the straight-jaw type.

Just 11 tools are needed for a range of ⅜" to 7" in Model MCA, and 14 for a range from ⅜" to 3¼" in Model BMC (straight-jaw).

LeCount Tool Works, Inc., West Hartford, Connecticut.

Use postpaid card. Circle No. 38

### Black Granite Reference Flats

High accuracy black granite reference flats for precision measurements in tool rooms, inspection departments and laboratories are now being made by Acme Scientific Company, Chicago.

Black granite is inherently non-magnetic and dimensionally stable. It will not warp even under extreme changes in temperature. Lapped to an accuracy of .000005", these black granite flats are used wherever a surface of known and accurate flatness is required as a reference stage in measuring.

Standard production is 6" and 8"

diameter flats. Special sizes and other accuracies can be made to meet specific requirements.

Acme Scientific Company, Chicago, Illinois.

Use postpaid card. Circle No. 39


NEW STASET CATALOG LISTS 232 STANDARD DIAMOND TOOLS

Plus FULLY ILLUSTRATED INFORMATION SECTIONS COVERING

- cluster & impregnated tools
- radius dressing tools
- boring & turning tools
- Staset "rib-nib" mounting
- wheel type tools
- grit & tandem tools
- blade type tools

This illustrated 36-page data source provides you with complete specifications and pricing of over 300 different Staset diamond tools . . . no other diamond tool catalog gives you as much comprehensive information as Staset's new Catalog #460! Whether your requirements for diamond tools are large or small, you'll find this handy *one-book* reference a valuable time saver.

DIAMOND STA SET TOOLS

*For your free Catalog #460, write*

THE STASET CO., INC.

66 FRANKLIN AVE. • WEST ORANGE, N. J.

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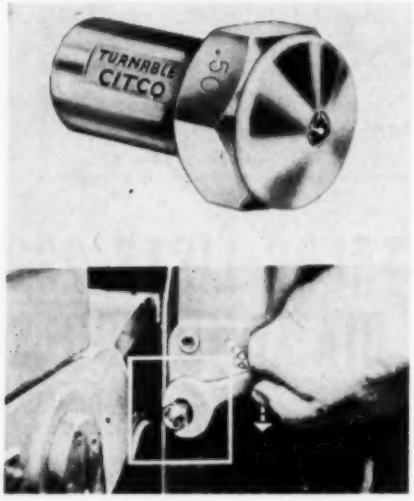
### Diamond Tool with Built-In Turner




Extending usable diamond life up to four times is one of the advantages claimed for the "Turntable," a new, patented diamond tool developed by CITCO. It is said to be the only such tool having a built-in turner head which provides proper diamond turning without need for re-positioning tool. This is estimated to save up to 75% on diamond cost by conservation alone. Smaller diamonds can be used. Broader applications are possible per tool size, thus minimizing tool inventories.

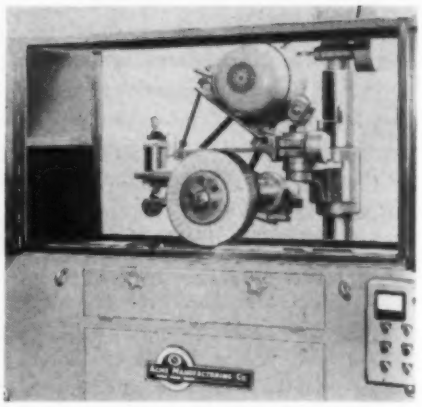
Cleveland Industrial Tool Co., Chardon, Ohio.

Use postpaid card. Circle No. 40

### Testing Machine Checks Buffing Variables

A new finishing process testing machine designed to enable manufacturers of buffs, compounds and base metals to study and evaluate finishing process variables is now available from Acme Manufacturing Company.

The new machine is a production model of an experimental prototype that was delivered to the American Electroplaters Society in 1957 for use in their finishing research programs. There are several variables that have to be considered in attaining a desired finish quality. Among these are the buffing wheel, the compound, the character of the base metal and such variables in the finishing process as pressure and time.



The Acme testing machine has been developed to permit study of all of these variables so that finishing processes and requirements can be more accurately specified and evaluated for the suppliers of metals, equipment and tooling items as well as for the plant finishing department itself.

Acme Manufacturing Company, Detroit, Michigan.

Use postpaid card. Circle No. 41

### Chrome-Lok Diamond Pins

A new line of diamond pins, available in a wide range of sizes, is ideally suited for jig grinding, internal grinding of small holes, and many other precision grinding operations.


# Now! see the NEW!
# K. O. LEE GRINDERS
## . . . the World's Most Versatile Grinding Machines!

The Model BA960 Universal Grinder is a result of over 30 years of experience in the manufacture of precision grinding machines, attachments and fine tools.

This machine is the biggest value in the industrial market. A truly universal machine, spindle speeds from 3450 to 20,700 RPM with standard equipment included, capable of handling all types of O.D., I.D. grinding operations demanded by the average shop.

K. O. Lee grinders have proven themselves year after year in the metal working industry. They have outsold all other grinding machines in their field.

We invite you to visit our Distributors. Compare this machine for quality, engineering, workmanship, sturdy construction and modern appearance against any machine on the market. See for yourself how much more you get for how much less you pay.

We believe that you will be pleasantly surprised.

**K. O. Lee Co.**
ABERDEEN, SOUTH DAKOTA

Model BA960 Universal Grinder
SHOWN WITH B943 MOTOR-DRIVEN WORK HEAD AVAILABLE AT EXTRA COST

**For Complete Information Write for Grinder Catalog TG-1 Which Lists Other Models and Fixtures**

Use postpaid card. Circle No. 250

Close tolerances at production rates can be achieved in hardened steel, ceramics, even carbides, since negligible wear is associated with the use of diamond. The diamond grains are permanently bonded to the hardened tool steel shafts by an exclusive "Crome-Lok" process to assure maximum service life and economy.

They are available in cylindrical shapes as shown, from as small as 0.020 diameter to 0.250. The pin shaft is undercut for a length of 3/8" to provide clearance for pins which are smaller than the 1/8" shank.

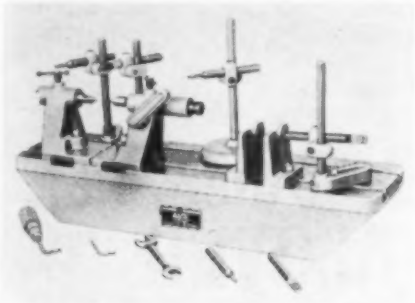
Two grit sizes are available; 200/240 and 80/100.

Titan Tool Supply Co., Inc., Box K, 1419 Hertel Avenue, Buffalo 16, N. Y.

Use postpaid card. Circle No. 42

### Low-Cost, Precision Bench Center and Surface Plate

The Model BC3 low-cost, precision bench center and surface plate, provides an accurate means for inspecting all types of work. Work pieces can be mounted between centers, in V-rests, or on the precision ground surface plate.



Runout is shown on dial indicator as work is rotated by hand. Four indicator stands are standard with the BC3 and can be positioned any place on the surface plate. Dial indicators not furnished.

Specifications: Distance between centers 22". Centerline height from centers to plate 4.130". Diameter of work over surface plate 8¼". Length of base 28". Net weight 102 lbs. Shipping weight 125 lbs.

K. O. Lee Company, Aberdeen, S.D.

Use postpaid card. Circle No. 43

### New Industrial Air Duct

A new type of industrial air duct, designed specifically for materials handling and heavy abrasive work, is now commercially available.

The duct, designated type 8R, is a neoprene-coated nylon fabric mechanically interlocked with an electro-galvanized steel spiral. Available in ID sizes from four to twelve inches, the duct is produced in standard ten-foot lengths. It is engineered to function within an internal temperature range of from —20° F. to 250° F.

Typical uses for type 8R include abrasive buffing, abrasive dust collection, glass cutting exhausting, protective boots, wood chip removal and handling of pulverized or granular materials.

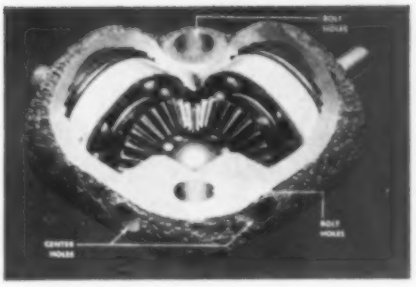
The Wiremold Company, Hartford, Conn.

Use postpaid card. Circle No. 44

### Heavy-Duty Angle Drive for In-Plant or Portable Use

Development of the ABL angle drive with heavy-duty bearing structure provides a component for in-plant production or portable use without overheating.

To facilitate the new product's use as a machinery component, the case is pre-drilled for mounting bolts, as



well as to provide center holes in dead alignment with the shafts.

Performance specifications include transmission in a 1-to-1 ratio of 1-1/3 hp at 3000 rpm's or 1/3 hp at 750 rpm's, and a maximum allowable speed of 6000 rpm's with standard lubrication. It can be used with air drills, flexible shafts, or with standard 1/4", 5/16", and 3/8 "electric drills.

Price & Rutzebeck, Hayward, Calif.

Use postpaid card. Circle No. 45

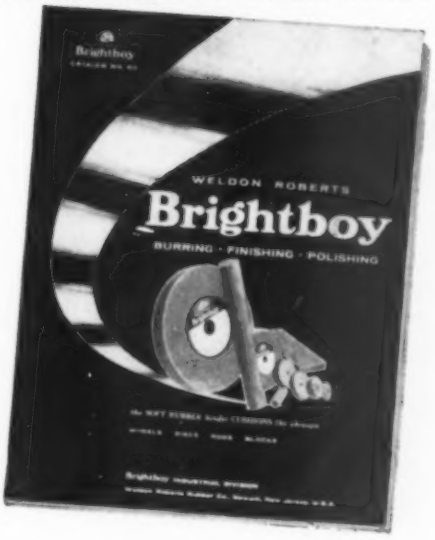

GET THE NEW, COMPLETE PICTURE

on MULTI-USE, SOFT RUBBER BONDED ABRASIVES —THE ONLY COMPLETE, COMPREHENSIVE STOCK LINE!

The revealing, new medium for achieving bigger time savings, improved product quality . . . —the revolutionary, new concept of abrasive uses!

Yours for the asking, the new *Brightboy Catalog* contains the latest working data, and product listings...

- Brightboy sizes, grains, textures, machine speeds, on all 49 readily available 'Job Matched' stock compounds for machine and manual operations
- new and revised wheel sizes; center hole specifications conforming to American Standards safety specifications
- refreshing, new methods and applications.




No plant working in metals, wood, plastics or laminated materials should be without this new reference catalog outlining the exceptional advantages of rubber-cushioned abrasives. *Write for it.*

★ ★ ★

WELDON ROBERTS Brightboy RUBBER CUSHIONED ABRASIVES

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Steet Newark 7, N.J.

*America's Pioneer Manufacturer of Rubber Bonded Abrasives*

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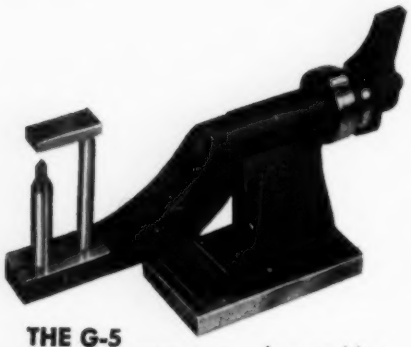
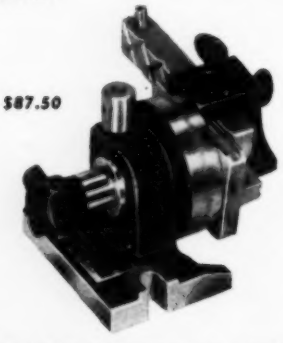
## Angle Tangent to Radius WHEEL DRESSING *Simplified* WITH ROTHFUSS TOOLS

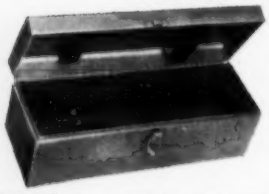


**THE G-5 RADIUS DRESSER** is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on all wheels up to 10" and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. ***Price $80.50***

***Price $87.50***



**THE G-2 ANGLE DRESSER AND TOOL HOLDER** is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up jobs to be milled, drilled, tapped on any desired angle.



**FREE STORAGE CASE** of light-weight steel, with a hinged top, heavy duty latch and a blocked interior to insure the safety of the dressers when carried.

**OUR FIXTURES** will dress most radii and angles tangent each other, similar to those shown below.

**All for only $149.50** *(including case and both tools with diamonds)*

***Distributorship available in select territories***

ROTHFUSS TOOL COMPANY

BOX 2696 ELMWOOD STATION PROVIDENCE 7, R. I.

Use postpaid card. Circle No. 252

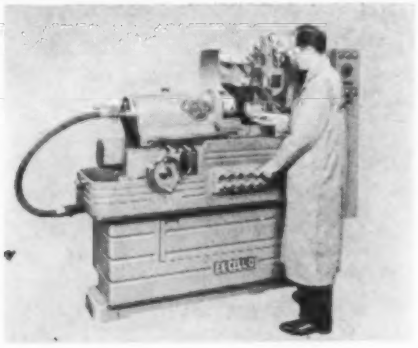

## NEW EQUIPMENT *continued*

### Versatile Thread Grinder

The Ex-Cell-O Corporation of Detroit, Michigan, recently shipped a Style 39-A thread grinder exhibiting several features of interest.

Contrary to normal practice, it was required to provide this machine with a range of grinding wheel speeds to suit a variety of work.

The machine was equipped with a standard Ex-Cell-O Precision Spindle arranged to run at 15,000 rpm. By changing pulleys, speeds under and above this figure are obtainable. To facilitate the grinding of small work, a Bryant High Frequency Spindle was also provided, capable of a wheel speed adjustable between 42,000 rpm and 60,000 rpm. The two spindles were readily interchangeable one with the other to facilitate setup and minimize change-over time. Since the Bryant spindle is water cooled a tank and pump cooling unit was provided to effectively



maintain a constant working temperature.

This thread grinder performs all the normal operations found on a standard Ex-Cell-O machine. Except for loading and resetting the wheel to initial grinding position, the machine cycle is fully automatic, permitting maximum production. Ex-Cell-O Corp., Detroit, Mich.

Use postpaid card. Circle No. 46

### Super-Comparator Bench Micrometer

A non-rotating spindle has been employed for a new bench micrometer designed for measuring small and delicate parts for the tool-making, instrument-making and electronic fields.


# The "Other Side" of CLOVER ABRASIVES

The most important side of coated abrasives is, naturally, *the cutting surface.*

But *the reverse side* can mean more to the user than the superficial appearance of the grit. It carries data on the bond, the weight of the cloth or paper, and the kind of grain. All of this has a great deal to do with the *performance* of the product.

Moreover, the manufacturer's name is a signature. If it says "Clover" on the back, you can be sure it is the best of its kind. Ask for a new Clover Catalog and get acquainted with our full line of abrasive products—*it is good business!*

## Clover Manufacturing Company

*Norwalk, Connecticut*

Victor 7-4515

Quality Abrasives Since 1903

*Makers of the famous* **CLOVER** Grinding and Lapping **COMPOUNDS**

Use postpaid card. Circle No. 253

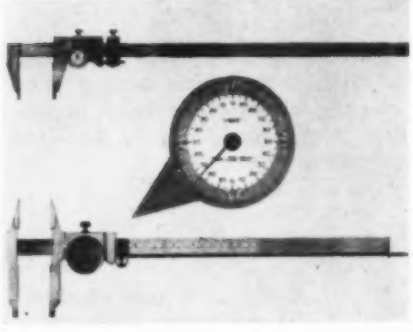
Introduced by the Mahr Gage Company, the instrument has a range from 0-1" and indicator reading directly in 20 millionths of an inch. The thimble diameter is 1¾", throat depth 1.280". Eleven different types of measuring anvils are available, may be interchanged readily without any need for adjustment.

Mahr Gage Company, Inc., New York, New York.

Use postpaid card. Circle No. 47

### Expanded Line of Dial Reading Calipers

The addition of 12" and 24" models of direct reading dial vernier calipers has been announced by Titan Tool Supply Co., Inc. This versatile tool is now available in four sizes, 6" and 8" in addition to the new 12" and 24" models.



This caliper is reported to permit fast, accurate measurement up to 0.001" without use of auxiliary scales.

All models are made of stainless steel and brass. All operating components are completely enclosed.

The 6" model sells for $39.00; the 8" models for $42.00; the 12" model for $59.80; and the 24" model for $166.30.

Titan Tool Supply Co., Inc., Box K, 1419 Hertel Avenue, Buffalo 16, N.Y.

Use postpaid card. Circle No. 48

### Retractable Air Coupling

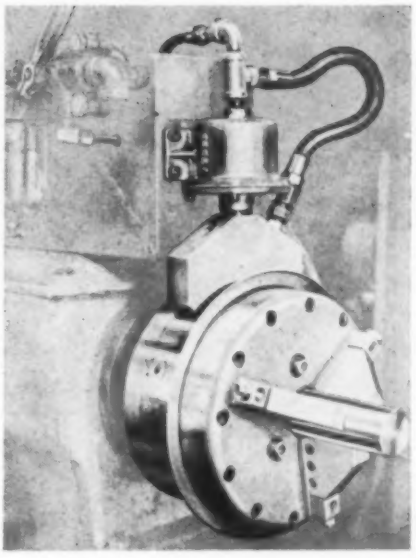
A retractable air coupling with self-contained air cylinder for power chucks with through-feed spindles can be used with either automatically cycled or manually controlled bar feed machines. It also aids in machining shaft-like parts that project into the spindle.

Use of the retractable air coupling eliminates the manually operated snap coupling or power wrench and reduces cycle time for load and unload stages.

The valve system incorporated in the adapter plate permits interchanging various types of air-operated devices without disturbing the control set-up. The present model is applicable only for devices on horizontal spindles.

N. A. Woodworth Company, Detroit, Michigan.

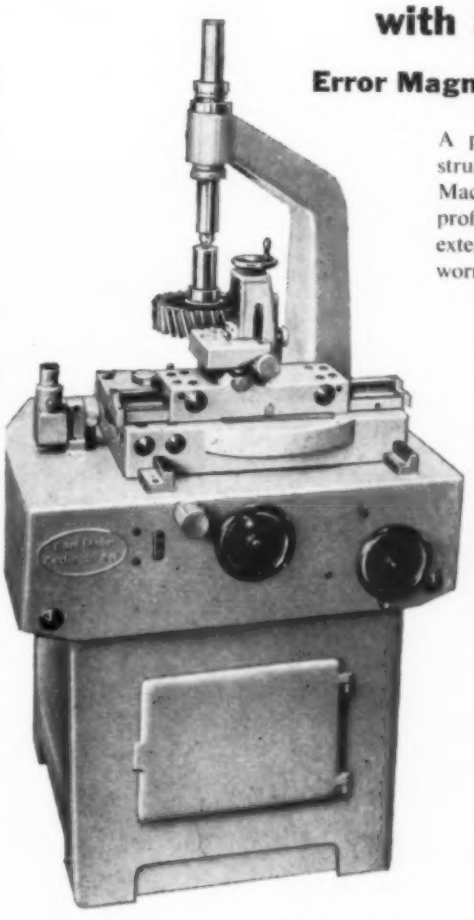
Use postpaid card. Circle No. 49




# Check Involute Profiles On Gears From 0-20" Dia.

## with a Mahr 890

**Error Magnification 500 and 1000 X**



A precision-built, highly sensitive instrument, the Mahr 890 Gear Checking Machine checks involute tooth flank profiles on spur and helical gears (both external and internal), bevel gears and worm gears.

**Reduced Testing Time**—provided by an infinitely variable, optical, base circle setting for gear diameters from 0-20"—with no need for base circle discs.

**Accuracy**—guaranteed by an extremely sensitive, shock-proof stylus and a recording magnification of 500 and 1000 X. Involute charts can be selected in ratios of 1:1, 2:1 and 4:1. Dust-protected, ball-bearing guides and chromium-plated guide ways assure smooth, low-friction operation.

**Range**—pitches from DP 1½ to DP 50 can be inspected with standard gaging points. Surface finish can also be checked and recorded easily with a knife-edge gaging point.

**Write For More Information**

**COSA**

*Importers of Leading Precision Machine Tools*
*Nationwide Sales and Service*
COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

IN CANADA contact Cosa Corporation of Canada, Ltd., 1180 Lakeshore Road, Long Branch, Toronto 14, Ontario

Use postpaid card. Circle No. 254

**"Wait'll I tell Charlie about these!"**

That's how it is with Jewel Brand Abrasive Belts. One satisfied user spreads the word about their superior grinding, smoothing and polishing performance and *bingo* . . . we've gained another valued customer! They're *that* good. Try some and see.

JEWEL BRAND

**COATED ABRASIVES**

*Belts • Rolls • Sheets • Discs • Specialties*

**ABRASIVE PRODUCTS, INC.**

South Braintree 85, Massachusetts

Use postpaid card. Circle No. 255


## NEW EQUIPMENT *continued*

### Design Change Doubles Sand Blasting Gun Power

A new pistol-grip design, providing the Model B portable "Sandy Jet" sand blaster with finger-tip control, is said to provide twice the power available in previous models.

The new gun can be equipped with any of three available nozzles, each designed for a variety of jobs. The

design also permits the use of most sand blasting abrasives—aluminum oxide, silica, nut shells, or metal shot.

Included with each unit is an operator's hood, a face shield, two extra nozzles, and extra air jet, and an Allen wrench. Price complete—$39.95.

ALC Company, Medina, Ohio.

Use postpaid card. Circle No. 50

### Optical Comparator

A new precision optical comparator has been developed by R-O Manufacturing Co. for mounting on their R-O grinder. With special adaptors it may also be mounted on other makes of grinders.

The comparator is supplied with 20X magnification lens and a 20X toolmakers' chart. 10X and 31.25X lenses are available as accessories.

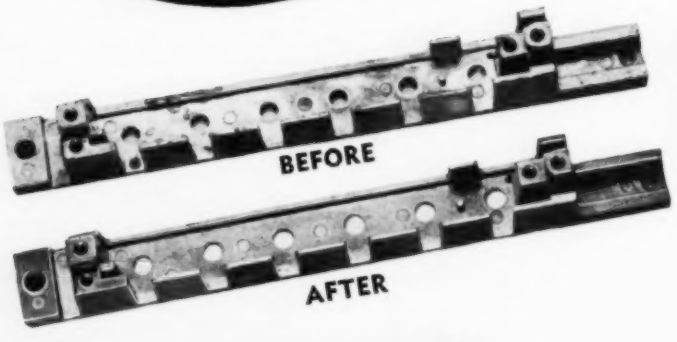
The swinging arm on which the comparator is mounted permits bringing it into the work and swinging it out of the way without interfering with the set-up.

R-O Manufacturing Co., Madison Heights, Michigan.

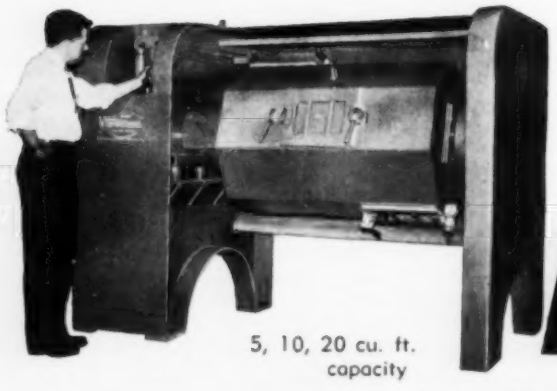
Use postpaid card. Circle No. 51


ELLIOTT VIBRASLIDE FINISHER

# FASTER ACTION, BETTER RESULTS, REDUCED COSTS in vibratory finishing




**Vibraslide Finisher removed ejector pin flash from thousands of these precision components of a new electronic communications instrument in minutes. Work could not be handled in conventional tumbling.**



5, 10, 20 cu. ft. capacity

Vibraslide Finishers are *thoroughly proven, highly flexible* (capable of more varied applications) in precision vibratory finishing. Unique vibration-with-rotation action drastically reduces time cycles . . . eliminates costly hand operations . . . handles more parts . . . substantially lowers all finishing costs.

DEALERS IN PRINCIPAL CITIES

Call or Write for Demonstration

Distributed by

mft equipment co.

410 Frelinghuysen Ave. Newark, N. J. Bigelow 2-6211

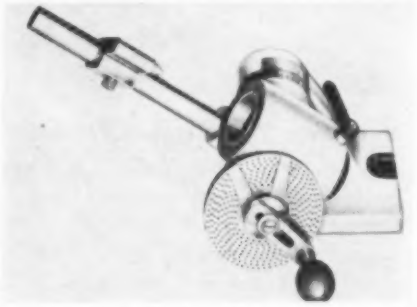
Use postpaid card. Circle No. 256

### Versatile Dividing Head

Designed for use in instrument and model shops to produce a wide variety of small precision parts with a minimum of set up time and effort.

Outstanding features are minimum overhang, height and weight which in addition to attaining maximum rigidity allows head to be readily used on rotary tables, milling machines, surface grinders, etc.

The spindle features 1" capacity with the use of 5 C collets, concentricity



within .0002, 360° swing in a vertical plane and indexing accuracy of one minute of arc. The spindle locks in taper section for greater rigidity and elimination of journal clearance.

Falcon Machine & Tool Co., Cambridge, Massachusetts.

Use postpaid card. Circle No. 52

### Air/Hydraulic Feeds

A new line of fully controlled hydraulic feeds for surface grinding, punching, shearing or pressing metals or plastics is powered by the shop's own air supply.

Compact, self-contained units of simple and rugged construction, they

require no pumps or motors, and are claimed to need only a minimum of simple maintenance.

They are said to be versatile, able to perform almost any sequence of operations automatically through the use of trigger valve actuators or solenoids.

For surface grinding they are adjustable to the proper rate of feed in inches per minute for various materials. They are also said to increase tool life in drilling.

Superior Controls, Crystal Lake, Ill.

Use postpaid card. Circle No. 53

**"So what else is good about them?"**

It's not enough to tell you Jewel Brand Abrasive Belts are "fast cutting, cool running, and long lasting". They *are* . . . but the best way to prove *all* their advantages is on the job. Give them a "show me" run soon!

JEWEL BRAND

**COATED ABRASIVES**

*Belts • Rolls • Sheets • Discs • Specialties*

**ABRASIVE PRODUCTS, INC.**

South Braintree 85, Massachusetts

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***INTRODUCING THE ALL NEW MODEL 306 STRAIGHT-O-MATIC***

***BY CURTIS***

- **PNEUMATIC BELT TENSIONING**
- **COMPLETELY VARIABLE BELT SPEED**
- **ACCURATE HEIGHT ADJUSTMENT**

**HERE'S THE MOST VERSATILE MACHINE** available today for polishing, deburring and precision grinding. Ruggedly constructed for long service, the Curtis 306 Straight-O-Matic delivers utmost precision on wet or dry operations...more plus features than any competitive machines—at lower initial cost!

***FOR MORE INFORMATION***

*Curtis Machine Division*
THE CARBORUNDUM COMPANY, Dept. GF
Niagara Falls, New York

Gentlemen: Please send me more details on your 306 Straight-O-Matic.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

H 59-03

*Curtis Machine Division* **CARBORUNDUM®**

*Machine Builders for the Metalworking and Woodworking Industries*

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**"Don't tell me you forgot to order more?"**

The inconvenience of running out of Jewel Brand Abrasive Belts is more than offset by the prompt service we offer on hurry-up orders. However, just to be safe, stockpile a reserve supply today.

JEWEL BAND

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**ABRASIVE PRODUCTS, INC.**

South Braintree 85, Massachusetts

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### Device Pre-Sets Depth of Cut in Portable Grinding

The Adjusto-guide (patent pending) is a new device with adjustable guides to allow pre-set depth of cut on both straight and curved edges in both air and electric rotary portable grinding operations.

The new device allows chamfering, de-burring and other similar operations to be done accurately and fast.

Adjusto-guide can be quickly positioned to desired depth of cut. It may be equipped with a variety of guide and design cutters to perform many formerly difficult operations with speed and precision.

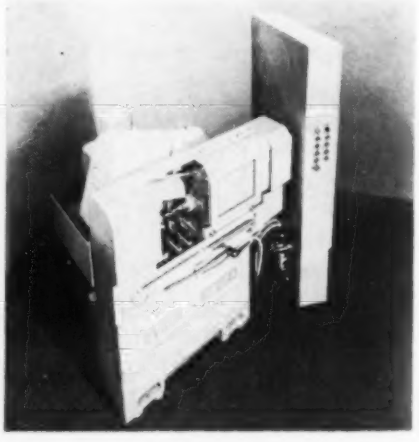
A & S Production Tools, Inc., Worcester, Massachusetts.

Use postpaid card. Circle No. 54

### New Gear Tooth Honing Machine

A new Red Ring Model GHD gear honer is much more compact than the former models, but operates on the same basic principles. Four different methods of honing are available on the machine to provide versatility of operation.

The new honer can handle gears up to 12" pitch diameter with manual or semi-automatic loading. With automatic loaders, the maximum size is 4" pitch diameter.



The machine has a 5" stroke and utilizes a 10" diameter honing tool. It is about 57" high, occupies a floor space, less panel, roughly 47" wide by 42" deep.

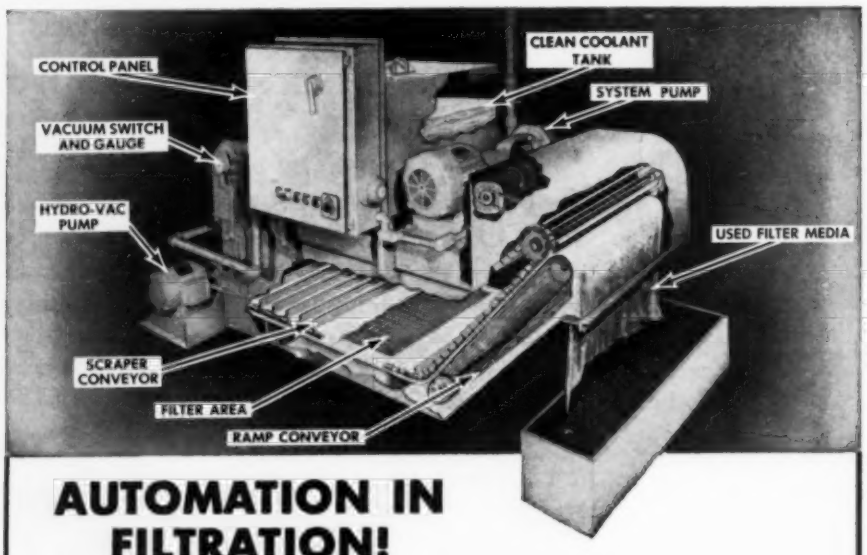
Model GHD machines are made in three types: standard, fully automatic and manual. All are equipped with the latest JIC standard controls.

National Broach & Machine Company, Detroit, Michigan.

Use postpaid card. Circle No. 55

### New Combination Finishing Machine

A new combination belt and disc finishing machine, capable of performing 90% of all shop finishing opera-


**AUTOMATION IN FILTRATION!**

- Completely automatic operation
- Used with individual machines
- Compact — with low liquid inlet
- Low operating cost
- Fine degree of filtration
- Pressure and vacuum forces act on filter media
- Any coolant — any sludge

**HYDROMATION FILTER CO.**

19661 Schoolcraft Detroit 23, Michigan VErmont 8-0492

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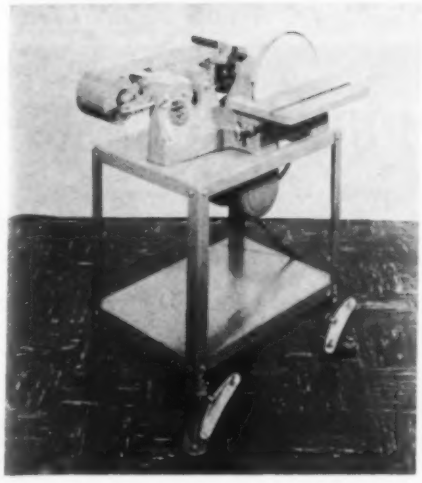


tions, has been introduced by Rockwell Manufacturing Company's Delta Power Tool Division.

The Delta Combination Finishing Machine, with standard 4-inch abrasive belt and 12-inch abrasive disc, was designed for use where custom or production finishing operations must be performed efficiently and economically. It is ideal for use in wood and metal pattern shops, sign and display shops, and all types of maintenance shops throughout industry.

Rockwell Manufacturing Company, Delta Power Tool Division, Pittsburgh, Pennsylvania.

Use postpaid card. Circle No. 56

### Small Hole Honing Tools

Honing mandrels and stones to bore diameters from .100 through .118" in increments of .002" are now available from stock, according to a recent release from Sunnen Products Company.

Actual range of each of these new mandrels is .004". For ultra-precision

work, however, the size of the unit to be used should also be within .002" of the final ID.

Made for use with Sunnen honing machines, these small mandrels are supplied in both hole (K series) and long hole (BL series) designs.

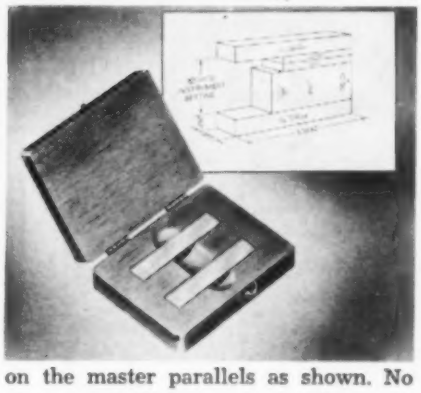
Sunnen Products Co., Dept. E-16, St. Louis, Missouri.

Use postpaid card. Circle No. 57

### Master Parallels

New master parallels announced by the Ellstrom Standards Division of Dearborn Gage Company are said to provide the most accurate, fastest and easiest means yet devised for setting internal measuring instruments.

To use, assemble the gage block combination required to obtain the desired instrument setting, then wring



on the master parallels as shown. No clamps or holders are needed, hence no external pressures can cause distortion or error.

Made of carbide, the parallels are guaranteed for flatness within three millionths. They are offered in pairs complete in special slotted wood case.

Ellstrom Standards Division, Dearborn Gage Co., Dearborn, Michigan.

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# VAPOR BLAST
## Liquid Honing*

**MACHINES PRODUCE DECORATIVE FINISHES QUICKER, CHEAPER AND BETTER ON**

- Cutting Torches
- Camera Parts
- Watch Bands
- Plastic Parts
- Watch Cases
- Eye Glass Frames
- Sewing Machine Parts
- Stainless Steel Pipe
- Machine Tool Dials
- Orthopedic Equipment
- Architectural Aluminum

• It cost you nothing to find out what this Vapor Blast process will do and how little it costs. Simply send a production part to our laboratory for a finishing touch. We will return it, with all data and the name of our representative nearest to you.

"WORLD'S LARGEST MANUAFCTURER OF WET BLAST EQUIPMENT"

*Liquid Honing and Vapor Blast are trademarks.

•

VAPOR BLAST MFG. CO.
3126A W. Atkinson Ave.
Milwaukee 9, Wisconsin

VAPOR V-B BLAST MILWAUKEE WISCONSIN

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Employees don't balk at wearing Rapido safety frames. Handsome Rapidos offer maximum protection and comfort. Universal nose bridge and exclusive Retrax Temples adapt them instantly to fit all workers; you slash your inventory.

Two sizes satisfy all fitting needs. Spread-end frame accommodates glass, plastic or prescription lenses; changes are made quickly, without heating.

Rapidos are available with or without lenses or side shields, and in a variety of attractive colors.

❶ **Exclusive Retrax Temples** slide in and out for perfect fit on any size face. ❷ **Universal Nose Bridges** fit everybody comfortably ❸ **Spread-end Frame** makes lens changing quick, simple. Takes less than a minute ❹ **Side Shield Models** of clear, pink or green transparent plastic.

*Write for Bulletin 459.*

WATCHEMOKET OPTICAL COMPANY, INC.

232 West Exchange St., Providence 3, R. I. • Throughout Canada: Levitt-Safety Limited

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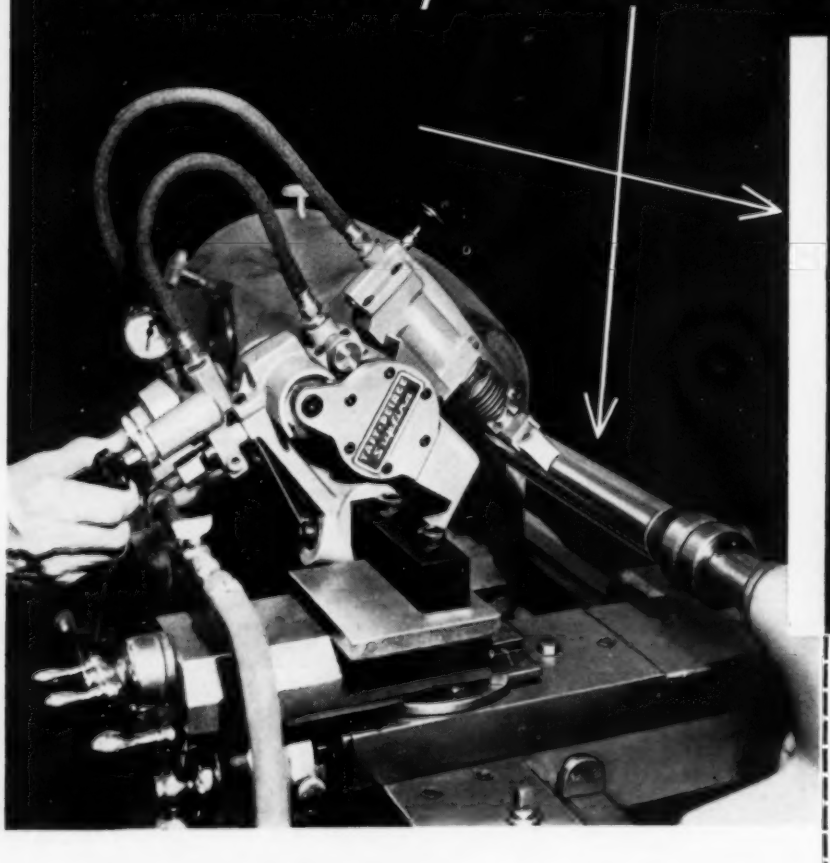
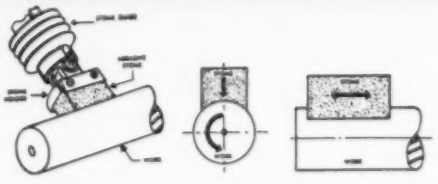
THE NEW WORD IN METALWORKING IS MICROSTONING!

# NOW! SIMPLIFIED, LOW-COST CORRECTION OF SURFACE GEOMETRY WITH TAFT-PEIRCE/SUPFINA MICROSTONING



This dramatic "before and after" evidence on a Talyrond chart shows how Microstoning corrected the surface geometry of a die set guide pin. The outside trace shows an average roundness of .00028" as ground. After Microstoning (inside trace), the roundness was improved to an average of .000030"



**Here's what happens . . .**

Microstoning is a low-pressure, low temperature abrading process using stones of various grit sizes. Stones are placed against the work with light pressure and vibrated from 1900 to 2500 times a minute as the workpiece rotates. The stones shape themselves to the mean radius of curvature, and more pressure is applied at high spots. This produces a fast and simplified correction of surface geometry that is demonstrated graphically by the Talyrond chart above.

Microstoning with Taft-Peirce/Supfina machine tool attachments produces a controlled microinch surface finish, removes cutting tool marks and grinding flats, and dramatically improves roundness.

The unique, patented Supfina design makes this precision surface correction possible. A free-floating piston, driven by compressed air oscillates an abrasive stone at high frequencies against the work — to achieve both desired finish and geometric correction in ONLY ONE OPERATION! All types of metals can be microstoned as well as hard plastics and other nonmetallic materials.

**Try Microstoning on your product!** Taft-Peirce/Supfina Attachments are low in cost and simple to operate. They can be used on lathes, boring mills, planers and other machines — to produce a precision surface and improve the performance of spindles, sealing rings, metal processing rolls, and bearing surfaces. Microstoning can be used on both flat and round surfaces. Contact your nearest Taft-Peirce Machine Tool Dealer for full information or write direct.

*Finish it with* **TAFT-PEIRCE** *SUPFINA*

TPS-15

TAFT-PEIRCE MANUFACTURING CO., 19 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND
Use postpaid card. Circle No. 263

# News from the Industry

## Timken Installs 84" Vertical Chucking Grinder

### Three-headed grinding machine, Timken's largest, grinds bearings with OD of over seven feet, holds runout within .0002".

● A huge vertical chucking grinder weighing over 100 tons, delivered recently to The Timken Roller Bearing Company, is capable of grinding bearings with an outside diameter of over seven feet. Now the largest grinder in Timken's U.S. operations, it required three railroad cars to transport the dismantled machine from Bridgeport, Conn., to Canton.

In overall dimensions the machine is 20' in length and stands almost 15' high. It rests on a steel reinforced foundation that required 45 yards of concrete. The base is insulated from the rest of the floor area to muffle vibrations caused by other operations.

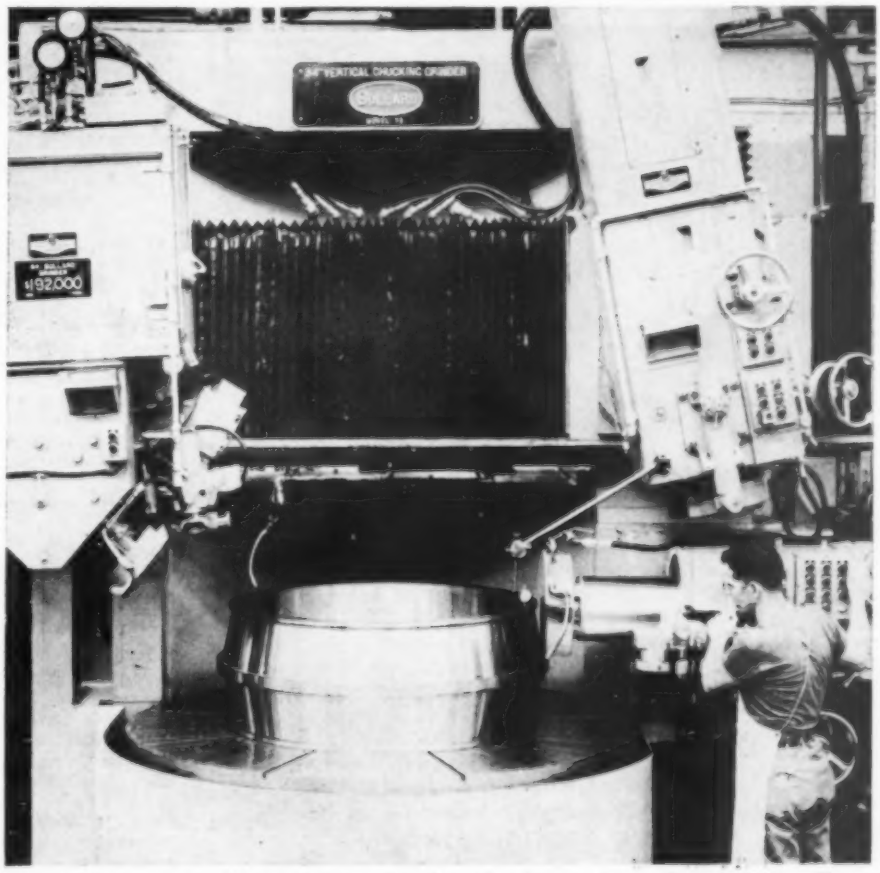
Despite its size, the grinder has held runout within .0002" on individual bearing cups, cones or thrust raceways.

Designed for versatility, the grinder is equipped with three grinding heads. The right-hand vertical head grinds the outside and inside diameters of cups and cones. The faces and ribs are ground by the side head. The vertical head on the left side grinds the complete profile of thrust raceways. All three heads are mounted on precision-made hydraulically controlled slides.

The magnetic chucking table has an outside diameter of 84", but can be fitted with a special magnetic plate to increase the diameter to 88". The chuck revolves in either direction over a variable range of speeds from 13.4 to 81 rpm.

All wheels used on the grinder are vitrified bonded. Those for the left spindle are special shapes for grinding thrust bearings, 60 grit, K grade aluminum oxide, either 14" x 2" x 8" or 16" x 2" x 8".

Wheels for the horizontal spindle, which grinds the rib of the bearings,




Front view of the big grinder, showing the inner race of a double-roller bearing being checked with a dial indicator. The magnetic chuck is 84" in diameter, can be expanded to 88".

## Caveat Emptor!
*...fact and fiction*

**Vapor Blast Used Glass Beads in '51!**
VAPOR BLAST pioneered and originated the "wet blast" process of metal surface treatment, perfecting it to precision Liquid Honing in 1940. They successfully used glass beads for surface peening as early as 1951.
*(Newcomers claim: "glass beads . . . a unique new method for surface or impact treatment".)*
An 8-year process is hardly "new"!

**VAPOR BLAST Liquid Honing Exposes Invisible Cracks!**
One of many benefits of Vapor Blast Liquid Honing is precision surface cleaning to expose "invisible" cracks for inspection, and preparing or opening metal pores for better oil retention. Now check this contradiction:
*(Newcomers say: "Surface pores are closed and fine cracks exposed".)*
An impossibility!

**HEAVY DUTY CONSTRUCTION!**
A Vapor Blast 6'-6" 4836 Liquid Honing Unit of S.A.E. 1020 steel weighs 1200 lbs., net. It's truly heavy duty, yet with no wasted weight.
*(Newcomers call a similar size unit, made of Stainless Steel "heavy duty construction". Yet, is weighs only 630 lbs.)*

**Experience Has No Substitute:**
VAPOR BLAST LIQUID HONING* is the *original* liquid abrasive surface conditioning process — proved in peening, finishing, cleaning, descaling and deburring in hundreds of plants in every industry. That's fact! Insist on the original — get the complete story of Vapor Blast Liquid Honing — or send us samples for laboratory processing without obligation.

*Liquid Honing and Vapor Blast are trademarks.

VAPOR V·B BLAST MILWAUKEE WISCONSIN

**VAPOR BLAST MFG. CO.**
3126A W. Atkinson Ave.
Milwaukee 16, Wisconsin

Use postpaid card. Circle No. 264


## NEWS OF INDUSTRY *continued*

measure 13" x 2" x 8", are 80 grit, H grade aluminum oxide. On the vertical spindle at the right, the wheels are 46 grit, J grade aluminum oxide, 16" x 2" x 8".

The right vertical spindle and the side head spindle revolve in either direction at a constant 1200 rpm. The left vertical head spindle has a variable speed from 600 to 3,000 rpm, and can also reverse direction. Each unit has a swivel-plate permitting grinding wheel angles to be varied.

A master console controls the major functions of the grinder. In addition, each of the three heads has its own controls. An accordion-type cover protects the precision cross rails on which the two vertical grinding heads ride. They can be horizontally fed through a variable range from 9.4 to 45.9 inches per minute. The entire machine is lubricated automatically. Counter balances throughout the grinder are hydraulic as opposed to the mechanical type found on most large grinders.

The large grinding machine was designed by Timken engineers in conjunction with engineers of the Bullard Company, who built it. • • •

### Carborundum Sets Up EMD Technical Branch, Building

The Technical Branch of the Electro Minerals Division of The Carborundum Company will have new laboratories and new offices for its technical personnel when the three-quarter million dollar building now under construction is completed in June of this year.

The announcement of the new technical building was made by Mr. Joseph S. Imirie, Vice President and General Manager of Carborundum's Electro Minerals Division. The new structure will provide laboratory facilities for physical measurements and quality assessments, product application, process development and chemical analysis. It will also provide pilot plants for abrasive powders as well as abrasive grains.

Manager of the newly established technical branch will be Mr. Bruce Walker. Reporting to Mr. Walker will be Mr. F. Paul Ronca, manager of quality control and Dr. Ronald W. Gillmore, manager of development.


THIS EXPANDING BACK-UP WHEEL FOR COATED ABRASIVES LETS YOU...

**CUT GRINDING/ FINISHING/ POLISHING/ COSTS 3 WAYS!**

**Sizes: 1" to 5" diameter— others on special order.**

***Flexcore*** expanding wheels provide triple savings by:

*1. Reducing abrasive costs up to 33%* — Expanding rubber flexers prevent band "walk off" . . . end abrasive waste . . . permit full use of each band.

*2. Eliminating wheel replacement costs*— Permanent metal core is never scrapped . . . low-cost rubber flexers are easy to replace.

*3. Speeding production*—*Flexcore* puts all your abrasive to work for you . . . more output per time and money invested . . . no time-consuming maintenance.

Use *Flexcore* on portable tools or bench-stands for all abrasive operations from heavy stock removal to smooth finishing.

***Test This Outstanding Wheel At OUR EXPENSE!***
***Write For 25-Day Trial And Technical Literature.***

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*...don't use makeshift dogs*

**BUY RED-E**

5 TYPES TO CHOOSE FROM

**GRINDER WORK HOLDING DRIVERS**

***GUARANTEE QUICK CHANGE-OVERS, POSITIVE GRIP, UNMARRED WORK.***

- Steel for extra strength.
- Balanced to prevent chatter.
- Finger tip control on cam action—self-locking.
- Quick adjustments for workpiece dia.

When ordering, please specify Steel or Brass Cams or Screws on Cam Action type.

Ask your distributor, or write for prices and catalog.

**CAM ACTION** Steel or brass cams & screws. Cap. 3/16" to 4".

**REVERSIBLE** Forged steel. 2 jaw sizes on ea. Replaceable brass tips and plates. Cap. ¼" to 6".

**UNIVERSAL** For plain or universals. Replaceable brass plates. Cap. ¼" to 2½".

**CUTTER GRINDER** Permits close face plate work. Cap. ⅛" to 2½".

**STRAIGHT TAIL** Replaceable brass plates and tips. Cap. ¼" to 6".

**IMMEDIATE DELIVERY**

CENTER and DOG Specialists Since 1908

RED-E-TOOLS **READY TOOL COMPANY**
162 Garfield Ave., Stratford, Conn.

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## Changing Faces . . .

**Frank F. Cramer** has been appointed district sales manager, Pittsburgh sales district, Bonded Abrasives Division of The Carborundum Company, Niagara Falls, New York. He succeeds Glenn S. Eisaman, who died recently.

**James N. Heald II** has been named to the newly-created position of manager of domestic distributor sales for The Heald Machine Company, Worcester, Mass.

Effective April 1, **Gregory C. Gates** was appointed purchasing manager of Pratt & Whitney Company, Inc., West Hartford, Connecticut.

New administrative vice president of Pratt & Whitney Company, Inc., West Hartford, Connecticut, is **Daniel C. McCarthy.** He was formerly with Mobil Oil Company.

The appointment of **Gilbert E. Perkins** as production manager, American Emery Wheel Works, was recently announced.

**Charles B. Eisenhauer** has been named general manager of the Electronics Division, Van Norman Industries, Manchester, New Hampshire.

Norton Company, Worcester, Mass., has announced the appointment of **Frank G. Gustafson** as supervisor, process engineering department, in Plant 7.

**Don Greenberg** has been promoted to be chief engineer of Barnes Drill Co., Rockford, Illinois. He was most recently a sales engineer, Honing Dept.

**Dr. R. W. Guard** has been appointed manager, product and process development engineering, Diamond Products Section, Metallurgical Products Department, General Electric Company, Detroit. In the same department, **George Hemmeter** has been transferred from the Ft. Wayne laboratory to be manager of manufacturing in the Specialty Alloys Section.

D. B. Scott has been appointed manager of Allis-Chalmers control department, succeeding **F. C. Ludington,** who will retire July 1.

**R. C. Bown,** assistant manager of the rectifier section of A-C, succeeds Scott as manager.

At Stewart-Warner Corporation's Alemite and Instrument Division, **Walter Schmid** has been promoted from chief process engineer to manager of manufacturing-engineering, while **John Simkus** becomes superintendent of all divisional assembly operations.

F. F. Cramer

G. C. Gates

G. E. Perkins

F. G. Gustafson

R. W. Guard

J. N. Heald II

D. C. McCarthy

C. B. Eisenhauer

Don Greenberg

G. Hemmeter


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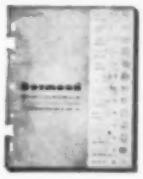

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TITLE

COMPANY

STREET

CITY/STATE

DRESS ABRASIVE BELTS FOR 30% LONGER LIFE

Unique Desmond Beltbrasive® dressers increase abrasive belt life 30% or more . . . give you "new" surface efficiency throughout belt life. Patented dresser quickly cleans out loaded belts, drums or discs on metal, wood or plastic jobs. One light pass when belt begins to load is all you need. Typical model costs less than $7. Ask your Desmond distributor.

*The only complete line of grinding wheel dressers and cutters*

**Desmond**

**The Desmond-Stephan Mfg. Co.**
**Urbana, Ohio**

Use postpaid card. Circle No. 267

# CRATEX RUBBERIZED ABRASIVES

re·li'a·ble: That which can always be counted upon to do what is expected or required

*Micro-deburring, Smoothing, Cleaning, Polishing*

**Cratex reliability lowers costs**

You can count on every Cratex item to perform just as you expect it to—exactly as the last one did and as the next one will. This is the key to efficiency in micro-deburring, smoothing, cleaning and polishing. YOU SAVE TIME because you know just what to expect in performance without experimenting or compensating. YOU SAVE REJECTS because with Cratex no unexpected irregularities occur to spoil work pieces.

**WHEELS · POINTS · BLOCKS · STICKS · CONES** in 4 grit textures for power or manual application. Sold through leading industrial supply distributors.

**FREE!** *Send for the complete CRATEX Industrial Catalog today*

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*The Most Complete Line of—*

# IMPREGNATED MOUNTED DIAMOND WHEELS

**(Resin and Al-Aloid Bond)**

**AVAILABLE ANYWHERE**

**For—**

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## NEWS OF INDUSTRY *continued*

P. J. Kennedy

**Paul J. Kennedy**, an 18-year veteran of the Thor organization, has been named district manager of the Cleveland sales and service branch of Thor Power Tool Company, Aurora, Illinois.

W. R. Hibbard

**Dr. Walter Hibbard** has been appointed manager of the Metallurgy and Ceramics Research Department, General Electric Research Laboratory, it was announced recently by Dr. Guy Suits, GE vice president and director of research.

Recently made known is the appointment of **Gordon L. Schuster** as president of Timesavers, Inc., Minneapolis, Minn. He succeeds **R. F. Pendergast,** founder of the company, who continues as chairman of the board.

G. L. Schuster

**Allan R. Redrow** has been appointed patent counsel for Norton Company, Worcester, Mass., taking the place of **George Crompton,** who retired in January.


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### Smithsonian Gets Huge Black Diamond, 740.25 Carats

The Smithsonian Institution has announced that it has recently received as a gift from Diamond Distributors, Inc., a Carbon—a Black Diamond—weighing 740.25 carats.

Carbon, sometimes called Carbonado or Black Diamond, is an opaque, black, tough, compact variety of diamond. It is found only in French Equatorial Africa, from which this piece came, and in Brazil.

This specimen is the largest mass of Black Diamond in any museum in the United States, and possibly in the world.

### A-C to Erect Plant at Harvey, Ill.

Plans for construction of a multi-million dollar engine manufacturing plant at the Harvey (Ill.) Works of Allis-Chalmers Manufacturing Company have been announced.

The new plant will be 1100 ft long and 440 ft wide and will occupy part of 35 acres of land acquired by the company in 1957. It will be a one story, steel beam and cement construction plant with about 515,000 sq. ft. of floor area.

### Auto Industry Praises Improved Plated Zinc Die Castings

Plated zinc die castings that will keep their bright appearance throughout the life of a car are now in sight.

This was the consensus of a panel of automotive industry plating experts commenting on a paper delivered at a recent American Zinc Institute-sponsored symposium on the plating of zinc die castings.

While looking forward to durable, corrosion-resistant plated zinc die castings in the light of presently available improved chrome and nickel plated zinc die castings, the panel members called for faster and more reliable accelerated corrosion tests; an effort to understand the basic reasons why the newly-devised plating systems work better; and the use by automobile manufacturers of minimums for plating.

### Pangborn Expands in Canada

Pangborn Canada, Limited, has been incorporated to market the complete line of blast cleaning and dust control equipment and metal abrasives produced by Pangborn Corporation, Hagerstown, Maryland. Offices are at 38 Mattson Road, Toronto, Ontario.

### New Machine Tool Distributor Selected By Allison-Campbell

Hallidie Machinery Company, Inc., 210 Hudson Street, Seattle 4, Wash., has been appointed as distributor in the states of Washington and Oregon for the Allison-Campbell Division, American Chain & Cable Company, Inc., Bridgeport 2, Conn., according to an announcement made recently by C. D. Cummings, sales manager.

### New Air Tool Plant For Master Power Corporation

A 14-acre tract of land on Cochran Road in Solon, Ohio, has been purchased to provide new manufacturing facilities for the Master Power Corporation, air tool subsidiary of The Black & Decker Mfg. Co. Contracts have been awarded to The Austin Company of Cleveland for the construction of a modern one-story factory and office building containing a total of 50,400 square feet. The entire project will cost approximately $700,000.

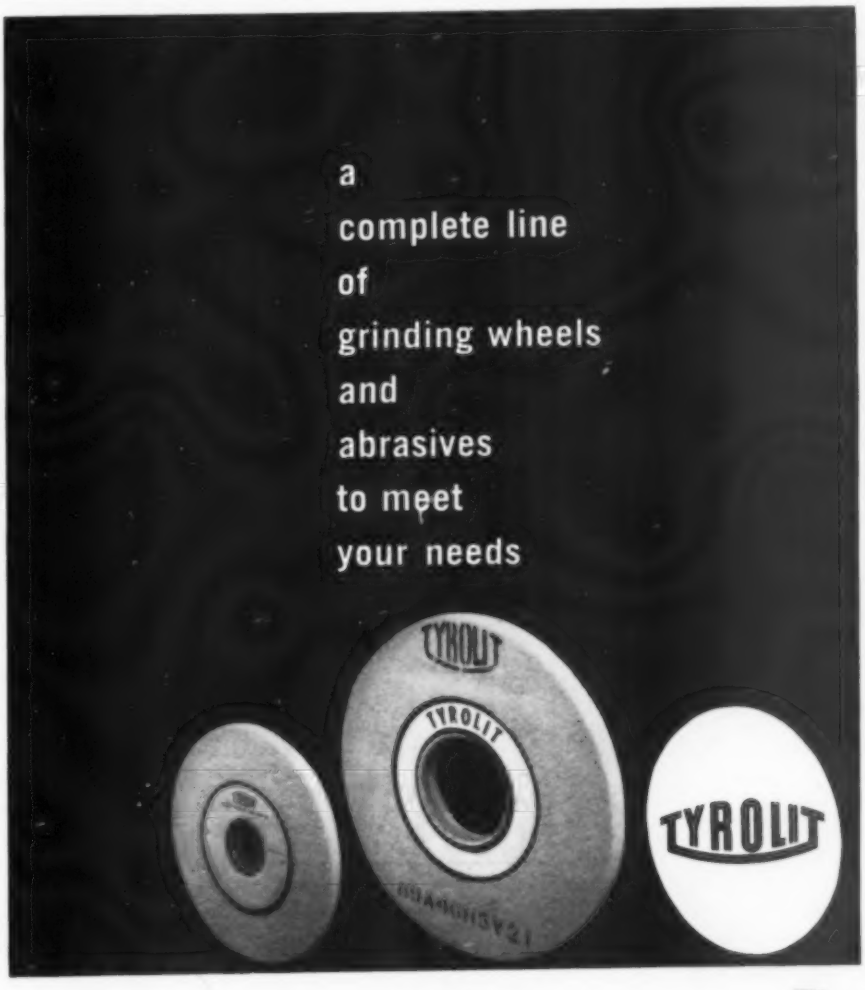
### Simonds Worden White Opens New Detroit Offices

The Simonds Worden White Company announces the opening of new facilities to house its district sales offices in Detroit, Michigan. Located at 14885 Meyers Road, the 2,500 square foot building contains sales offices for both the Dayton Safety Grinding Wheel and Machine Knife Divisions. Former offices had been on Grand River Boulevard for more than twenty years.

### Esbec Shortens Name

With the formation of its new Industrial Chemicals Division, the name of The Esbec Barrel Finishing Corporation, of Stamford, Conn., has been shortened. The organization is now to be known as The Esbec Corporation.

No change of ownership or personnel is involved.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Harrington-Wilson-Daum Corporation, New York, N.Y., has promoted **C. Morgan Newbury** from district manager to assistant general manager, and **Charles B. Tansley** to vice president, sales. Tansley formerly was president of Bryant Machinery Co., Chicago.

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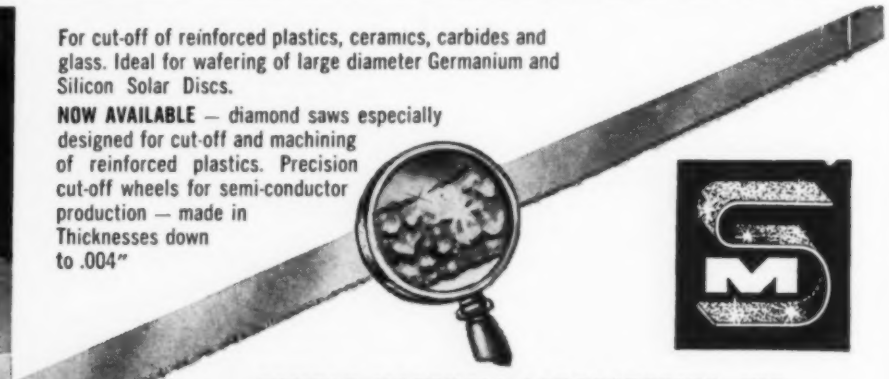

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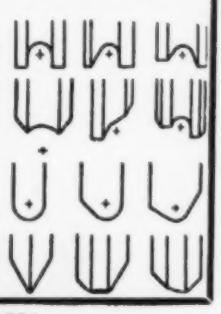

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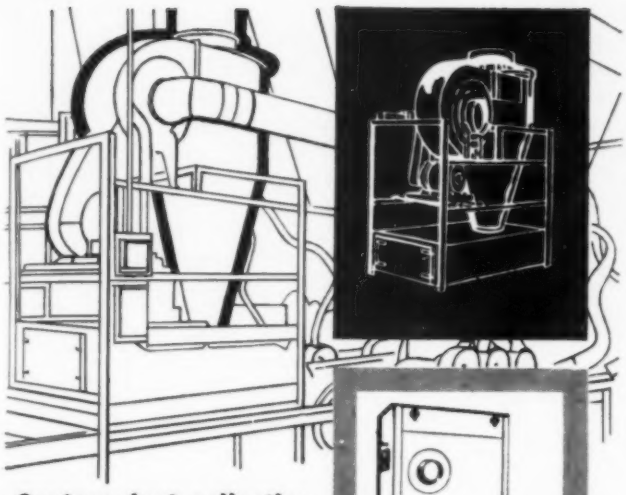

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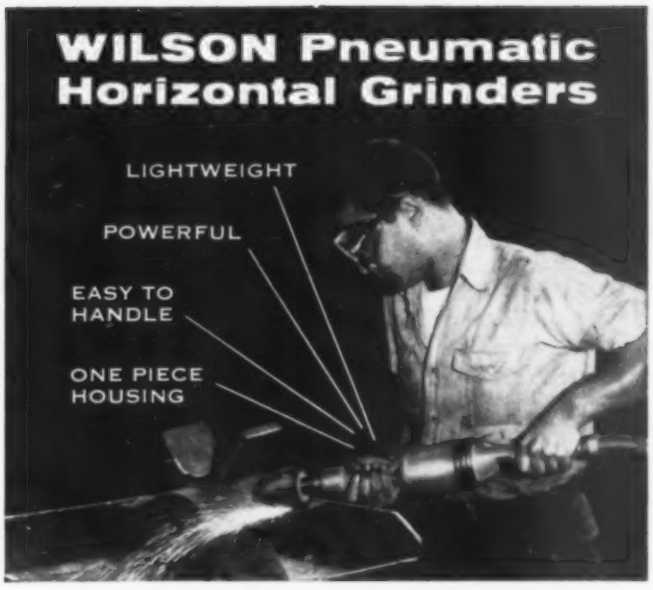


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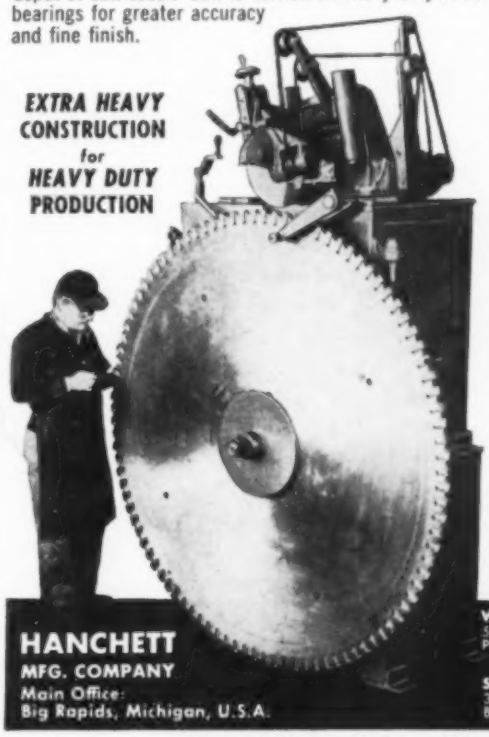

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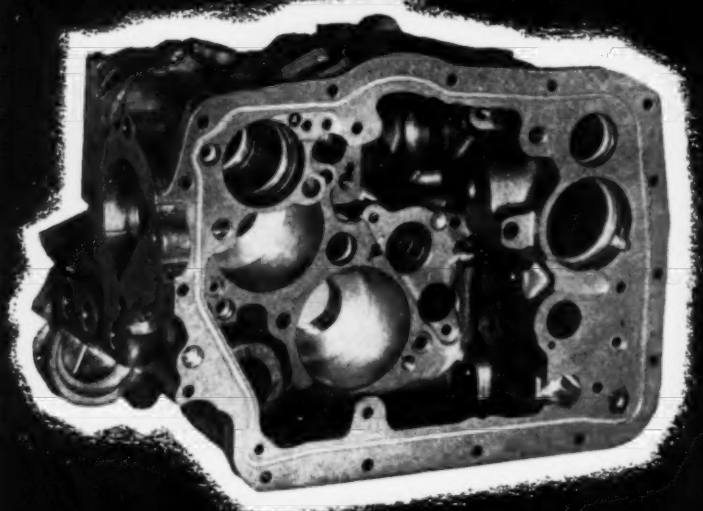

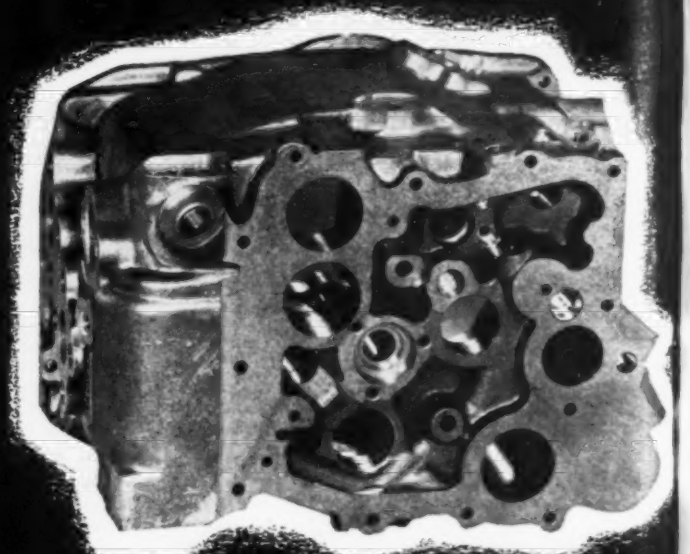

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# GRINDING and FINISHING

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# Coming Next Month

**Wheel Testing**
Several experts in the field of wheel application discuss the basic points of wheel testing outlining procedures.

**Abrasive Cutting Part II**
Second part of this two part series will cover work holding, abrasive cut-off wheels, case histories and procedures.

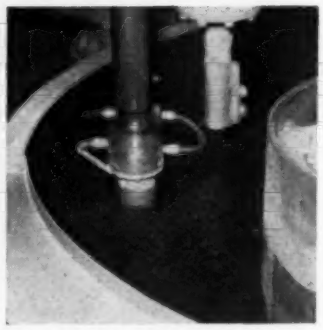
**Motorized Wheel Dresser and Record Method Cuts Diamond Wheel Costs**
High cost of dressing is reduced and additional costs controlled by a tool manufacturer.

**Gear Honing**
Gear finishing after hardening greatly improved sound characteristics and increased longevity of gears.

**Modern Disc Grinding**
Comprehensive discussion of the techniques of disc grinding including case histories, methods and abrasives.

# Here's how ALMCO's New Spindle Finishing Process gives precision finishing of complex components...

**1** Operator air-chucks part to be finished to spindle after having just released the finished part.



**2** Part is lowered into high velocity stream of abrasive media. Spindle rotates while in stream.

**3** Index head carries spindle thru tub of abrasive media until it again reaches operator's station. Water rinses media away.

**4** Result: fast and even action! In most cases, 0.005 to 0.015-in. radii can be generated on hardened gear teeth in 2-4 mins.

## ...and on a continuous production line basis!

**The ALMCO Spindle Finishing Process** now makes possible precision finishing of complex, high-quality components such as gears, bearing cages, spline shafts, pump rotors, jet blades, etc. . . .

- *at production rates heretofore not possible . . .*
- *on a continuous production line basis . . .*
- *and with all surfaces receiving the same controlled amount of precision finishing!*

**Here's how it works.** Large parts or clusters of smaller parts are chucked directly to the spindles from a single operator's work station. Spindles lower the parts into a high velocity stream of abrasive media contained in a tub that rotates at a controlled speed of from 275 to 600 sfpm at the spindle center line. Spindles themselves also rotate at 13 rpm while in the abrasive stream, while the indexing head slowly carries all spindles in a 1 to 9 minute trip around the tub. Operator merely removes and replaces parts on spindle chucks as they appear before him.

Models are available with automatic or manual indexing, 2 to 16 spindles, tub diameters of 48" to 90", and drives of from 5 to 30 hp.

**For Full Story** on ALMCO Spindle Systems and on free processing of sample parts, write for ALMCO Album of New Products!

ANOTHER REPORT FROM THE ALMCO ALBUM OF NEW PRODUCTS

**ALMCO**
**QUEEN PRODUCTS DIVISION**
*King-Seeley Corporation*
85 E. Main St.
Albert Lea, Minn.

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# A Final Thought

## Can You Use An Abrasive Specialist?

How do you determine the need for an abrasive specialist in your plant? As a rough rule of thumb, if your expenditures for abrasive products exceed $50,000 you should be concerned with the advisability of placing someone in charge of abrasive operations.

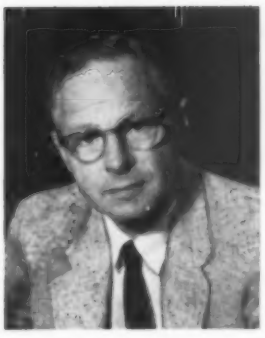
This $50,000 figure is large enough to permit the man's salary to be taken out of the savings he will realize during the first year on the job. Such an expenditure for abrasives further implies that you have sufficient equipment to permit future planning for grinding operations. In time, your abrasive specialist will deliver cash savings and increase efficiency three to four times his salary. If your outlay for abrasives is larger than $50,000 the savings will dramatically increase.

How can an abrasive specialist serve you?

By closely working with the suppliers he will soon determine which supplier can deliver just the right product for the job at hand. Eliminated here is the trial-and-error method which robs you of production time. He will take the mystery out of grinding.
He will build a library of information on such subjects as: which manufacturer's wheel is identical to the wheel of another manufacturer. This is important, especially where volume purchases of several types of wheel are made. While wheel manufacturers stick to one marking, there are still differences between wheels. Your specialist can begin to match markings, wheels and suppliers with a benefit to you.

An abrasive specialist is not at the mercy of a salesman who, while absolutely honest, is frequently merely a salesman and not a trained engineer. In the purchase of all industrial supplies, not only abrasives, there is danger that a competent salesman will sell you something which while good, is not designed for your particular needs. An abrasive specialist can save you money here. For instance, a purchasing agent told us he recently studied industrial diamonds, and in one year reduced the cost of industrial diamonds from $10,000 per year to $3,500, without sacrificing efficiency. He's been most active in his company for the engaging of an abrasive specialist. "If we can do this in diamonds we can do it in abrasives, where our savings could be as much as $30,000 a year." His company is now in the process of promoting a man into such a position.

An abrasive specialist can throw many jobs on a grinder with remarkable cost-and-production-saving results. Thousands of jobs in all types of industries could be placed on a grinder with terrific savings. Unless a man who knows his way about is placed in charge, the easiest road is always taken—do it as before. Grandpappy's way of doing it is not always the most economical.



We've not covered all the advantages of appointing an abrasive specialist. The title is non-essential, the man may be assigned from within your plant, these are details which do not affect the basic thought: when you place a man in charge of abrasive operations you will save money. You will increase production. You will be more efficient.

Wm. F. Schleicher

Vice President & Editorial Director

# new INCREMATIC downfeed

**all Grand Rapids precision tool room type hydraulic feed surface grinders now available with automated cut-out after pre-set stock removal**

No. 350

Plus other features, too, such as: Rugged, one-piece column and base casting • Greased-for-life precision ball bearing spindle • Instantly variable hydraulic table speed • Variable speed hydraulic cross feed and continuous cross feed • Powered vertical movement of wheel head.

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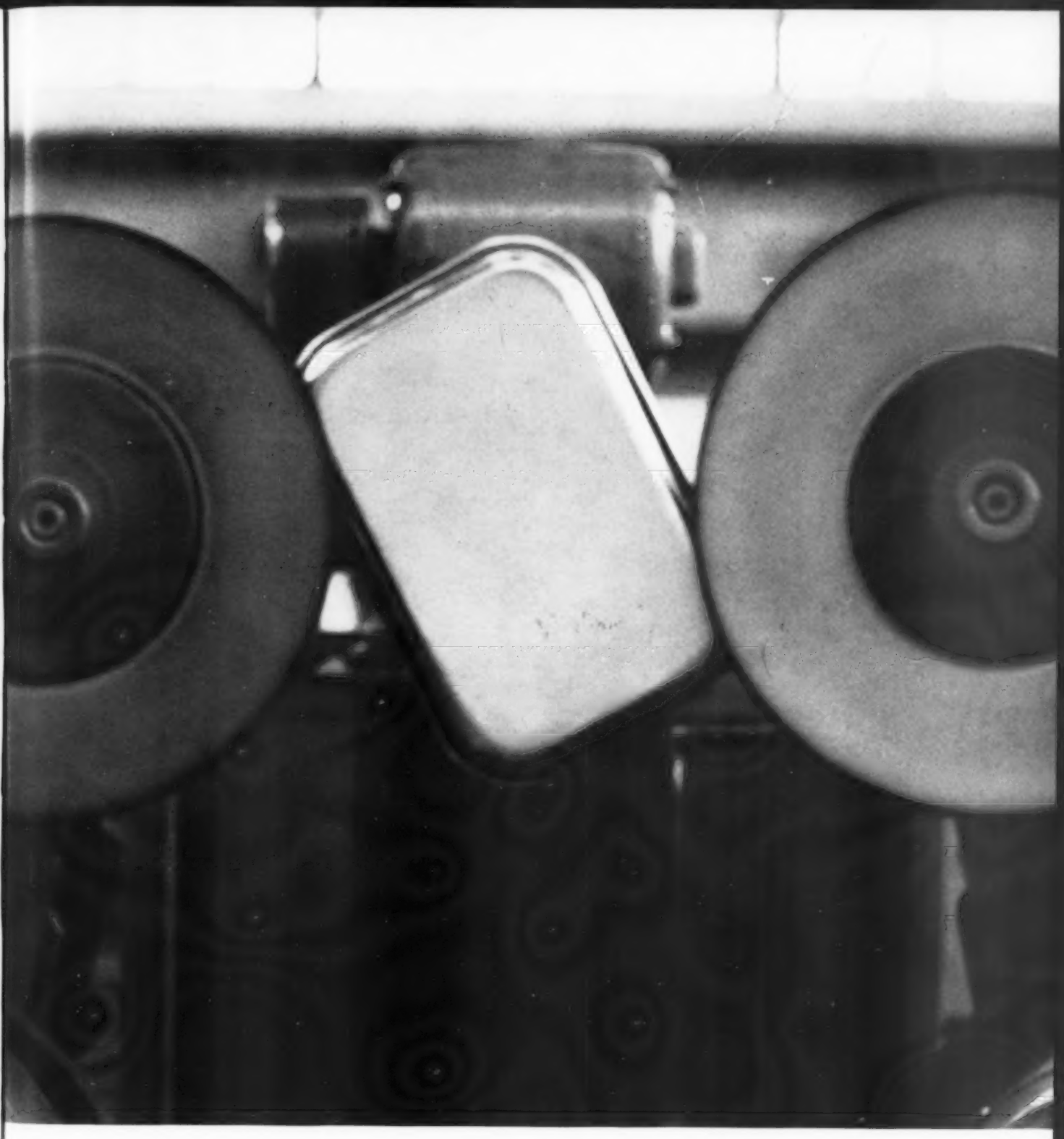

whatever your finishing problem

# ACME has—or will design—a machine to solve it

*ffing a Roasting Pan* is usually a two-machine operation. Here, wever, you see a roasting pan going through a double-head Acme mi-automatic unit for cutting and coloring simultaneously. As the n is rotated between the wheels, a special cam maintains uniform ssure while one wheel cuts and the other colors. Adapting this ndard Acme machine to a double semi-automatic procedure has sed production and reduced costs. ■ Acme customers, large and all, expect this kind of efficiency. Basic finishing machine designs achieved over 50 years give these cost-conscious companies the advantage of selecting one of many equipment arrangements, even for specialized applications. Building hardware, automotive trim, household appliances and kitchen ware, electrical and plumbing fixtures, primary metal sheets and coils—these are some of the many mass-produced parts and products now served efficiently by Acme machines. Fact is, Acme has—or will build—machines to solve any finishing problem. Call or write for comprehensive catalog today.

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# HYDRAULIC SURFACE GRINDER

MODEL 540
6" x 18" CAPACITY

MICRO MATIC
HONE CORPORATION DETROIT MICHIGAN
MANUFACTURED BY
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## ACCURACY...
## EFFICIENCY...
## EASE OF OPERATION

This machine has all the essential qualities required to provide high caliber surface grinding. Its simplicity of design provides ease of operation while inherent accuracy and efficiency assure excellent grinding performance. Thousands of these grinders have been purchased by discerning users in every part of the world.

## FEATURES:

- Completely centralized controls within easy reach of operator.
- Patented low-pressure, long-life Hydraulic System operating from self-contained motor-driven pump unit.
- Table traverse rates variable from 5′ to 40′ per minute. Smooth and shockless reversing at maximum speeds.
- Cross-feed automatically variable from .01 in. to .07 in. per stroke.
- Hand controls provided for both traverse and cross-feed. Micrometer adjustment to cross-feed in .0001 in. divisions.
- Vertical adjustment of wheelhead controlled by conveniently placed handwheel having a micrometer knob adjustment in .0001 in. divisions.
- Wheelhead slide operates on ball bearing rollers running on precision ground bars providing absolute sensitivity of vertical feed.

Automatic vertical wheelhead feed and electric lift can be fitted to standard machine as an extra feature. Also, numerous other attachments including form tool grinding equipment are available to assure full versatility.

**FOR FURTHER INFORMATION, WRITE FOR YOUR COPY OF BULLETIN C183.**

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